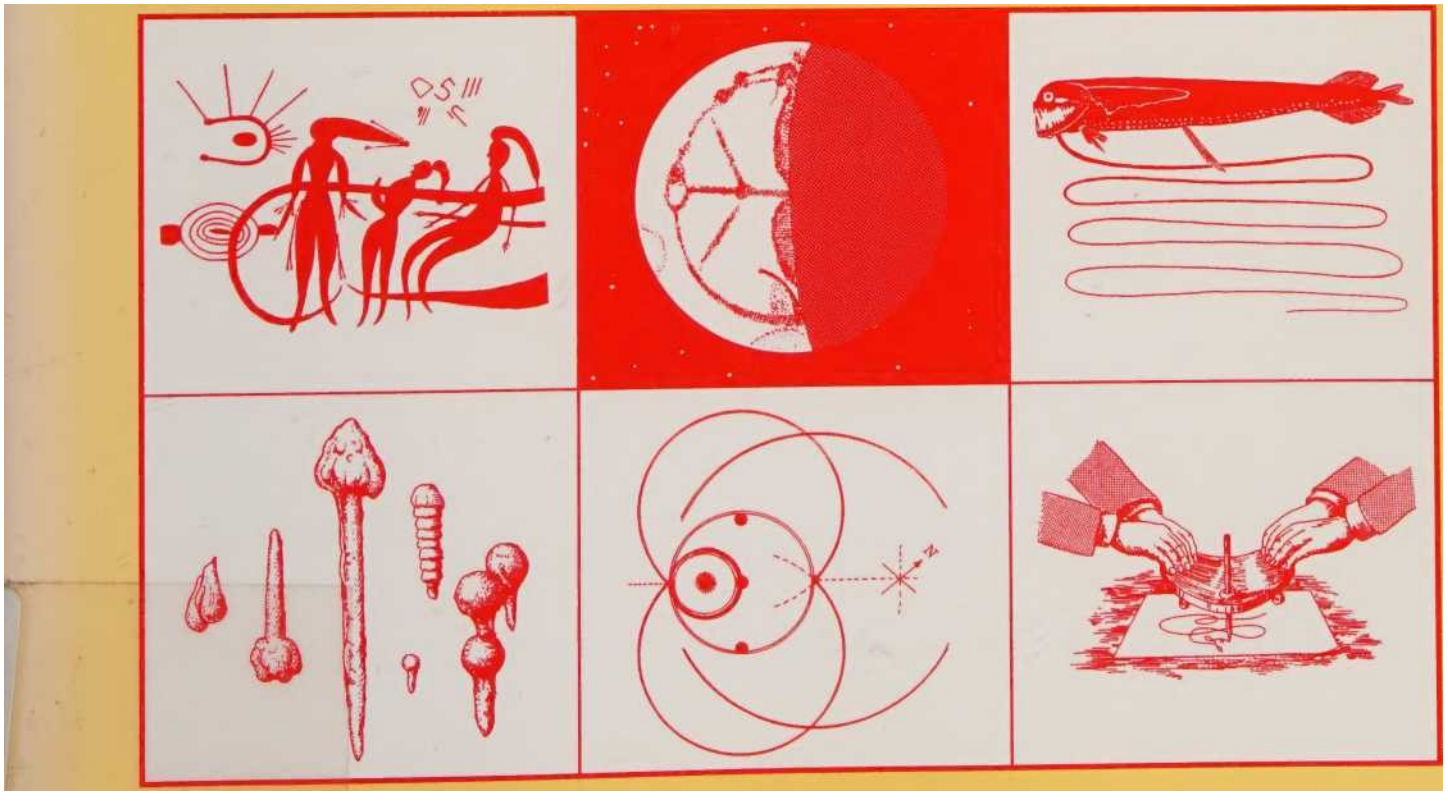
SCIENCE FRONTIERS II

MORE ANOMALIES
AND
CURIOSITIES OF
NATURE



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SCIENCE FRONTIERS II

MORE ANOMALIES AND CURIOSITIES OF NATURE

COMPILED BY:

WILLIAM R CORLiSS

Published and Distríbuted by:

The Sourcebook Project P.O. Box 107 Glen Arm, MD 21057 USA

DEDICATION

To my wife, Ginny, for her love and support

PREFACE

The first volume oí Science Frontiers was pubUshed in 1994. It eontained about 1900 digests oí anomalies and difficult-to-explain observations that I liad winnowed mostly from Science seríais that had appeared between 1976 and 1993. This second volume extends the coverage from 1994-2004, During this decade, I havc extracted about 1200 re- ports of science anomalies and major curiosities, making a total of 2700 for the período 1976-2004.

I believe my eclectic, hopefully ob- jective survey, relying ídmost exclusively upon the major science journals and rcagazínes, such as Nature and Science, mil impress the most jaded skeplie tTmt anomalies of scientific valué are ubiqui- tous in the natural world. I personally find these 2700 digests beguiling, fasci- nating, and as possible sources of ex- citing seience-researeh projects. His- tory has shown that science often makes great leaps forward by challenging para- digms with observations that "do not fit." This üook brims with these!

Both volumes of Science Frontiers are based upon my bimonthly newsletter of the same ñame. Volume I encompasses íssues #1 through #86; Volume II, #87 through #150. Each volume has been organized uceording to major science disciplines; ArcheoJogy, Astronomy, Biology, etc. Of cour.se, completeness ís an impossible goal. I chose only those anomalies and curiosities that appealed to me the most. Even so, 1 am sure many scientists and lay persona will be duly impressed by the vast panorama of still-unplumbed mysteries I lay out before thern in this thick volume.

From Pre-C)ovis archeological digs in South America, to the puzzles of genome expression, to the evidence for geologi- cal havoc wreaked by asteroid-raised tsunamis; the variety and riehness of the natural world are seen on every page— and so are the scientific puzzles they pose for us.

■

I confcss that my newsletter Science Frontiers was designeb to lure readers to partake in a much larger, more com-prehensive banquet; my Catalog of Anean alies. This Work, now 23 volumes Iñ length (out of a projected 35) delves far more deoply into anomalistics. This series ís based upon my file of some 50,000 ítems gleaned from a 30-year survey of about 16,000 volumes of Science journals and magazines from 1820 to date----over 180 years of science re-seareh and aceumuLated records of anom-alous observations.

This massive hoavd of scientific enigmas, parudoxes, and esotérica was assembled bit-by-bit from 427+ volumes of Nature; 304+ volumes of Science, and long library shelves of other journais.

I believe my collection is unique. It transcends modern computerized data bases in its deep time dimensión and in íts highly selective focus upon the anomalüus and curious.

The Sourcebook Project, publisher of both Science FrontierE and the Catalog of Anomalies, is my personal meehanism . for exploring the unknown and promul- gating its findings. Beeause the Sourcebook Project is a one-person endeavor and must be self-supportiug', its prior- ities necessarily differ from the usual science-research efforts. My priorities have had to be as follows:

Goal #1. Satisfying my own euriosity;

Goal #2. Marketing enough books to support my Project beeause outside fundmg for "anomalistics" is virtually nonexistent; and

Goal #3. More altruistieally, the hope that there may be something scientific all.y useful in all my library research.

Sorae scientists may be surprised that that the mainstream literature of science has yielded ivpwards of 50,000 references embracíng anomalies. Surely Nature oan-not be that enigmatíc and cryptic! Actu- ally, my research is far from complete.

I have trawled through only a small fraction of the English-language journals. Untoucbed are thousands of books, mono- graphs, doctoral theses, and tmost sig- nifieantly) foreign-language sources.

The implication is unassailable: Nature is much more anomalous than even the following pagos and the 23 volumes of the Catalog of Anomalies intímate.

Since the publication of Volume I in 1994, many cherished paradigma have been placed at risk by discoveries in all branches of science. llere are a few examples of paradigm-ehanging fínds in the past decade.

Archeology: The 9,000-year-old, Caucasoíd skeleton of Kennewiek Man.

Astronomy: Observations suggesting that 96$ of the universa is composed of unseeable dark matter and dark energy

Biology: The small size of the human genome and its remarkable similarities to the genomes of other organisms that are, nevertheless, morphologically highly diver gent.

Geology. Evidence that the buried Mexican cráter Cliixculub may not have caused the demise of the dinosaurs.

Geophysies: The sprites, blue jets, and other luminous phenomena that rise toward the btratosphere from the tops of thunderclouds.

This list is expended greatly in the following pages and, in even gieater seope and depth, In the Catalog of Anomalies.

Some eurrent buzz words in science are "chaos," "eomplexity," and "emer- gent properties." These words and their brethren combine to eharacterize a cosmos that is frequentiy:

í> Unpredictable (as in weather fore-easting beyond a few days;

oComplex (as in all life foims),

cNonlinear (as in virtually all real natural phenornena)

«Discontjnuous (as in saltations in the fossil record);

nOut-of-equiübrium (as in the ob-served rapid biological adaptation and speciation); and

•Possibly purposeful (as seen by some in frequent biological convergence and the Chemical and physical evidence for an anthropic cosmos).

Eroding fast are the philosophical foundation stones of the classlcal dock-work, deterministic universe. The sheer abundance of anomaUes is a driving forcé behind this change in science's concep- tion of the cosmos,

My view is that anomely research, while not science per se, has the poten- tial to destabilize paradigma and accel- erate scientific advances. Anomalies re- veal Nature as it really is: complex, chaotic, in constant flux, "possibly" even unplumbable by the human brain.

AnomaUes foster the t'raming of rogue paradigms, such as morphic resonance, coid fusión, and icy minicomets. They sometimes hint at bizarre and seemingly alien facets of Nature, such as coinci- dence and seriality. Some of these aber- rant ideas will be proven false., but some will sur vive.

The pages of this book and its pre-decessor may seem overly iconoclastie, sometimes verging on pseudoscience; but the history of science tells us that future students of the cosmos will laugh at today's conservatism and lack of visión!

William R. CorUss
September 1,
2004

CATALOGS:

Lightning, Auroras, Nocturnal Lights Tornados, Dark Days, Anotnalous Precipitation Earthquakes, Tides, Unidentified Sounds Raro Halos, Mirages, Anomalous Rainbows Remarkable Luminous Phenomena in N ature

The Moon and the Planets
The Sun and Solar System Debris
Stars, Galaxies, Cosmos

Carolina Bays, Mima Mounds, Submarine Canyons Anomalies in Geology Neglected Geological Anomalies Inner Earth: A Search for Anomalies

Biological Anomalies: Humans I Biological Anomalies: Humans II Biological Anomalies: Humans III Biological Anomalies: Mammals I Biological Anomalies: Mammals 11 Biological Anomalies: Birds

Ancient Infrastructure Ancient Structures
Archeological Anomalies: Small Artifacts

Handbook of Unusual Natural Phenomena
Ancient Man: A Handbook of Puzzling Artifacts
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ANCIENT ENGINEERING WORKS

NORTH AMERICA

Al! of the sections of this chapter on archeology are divided first by geographical región and then by specific phenomena. Here, under the heading of "Engineering Works,[11] we begin our standardizad geographical trek in North America, then move south through Mesoamerica and South America, and thence out to the rest of the World.

In North America, the decade 1994-2003 has yielded significant ítems in the following areas:

ÉtNew England Stone Structures. More data on the potentiallty anomalous Upton and Gungywamp stone chambers.

sEnigmatic Structures in the High Arctic. A curious standing stone of possible Viking origin.

sMidwestern Precolumbian Works. New finds in the Cahokia mound, the Hopewell road, Illinois stone fórts, Ohío's oíd pit furnaces.

eAncient Copper Mining around Lake Superior. Where did all that copper go?

sUnexplained Holes in Boulders. Are they really mooring stones?

«Shell and Mound Rings in Southern States. The Florida shell islets and the incredibly oid Watson Brake circle of mounds.

©Engineering Works of the Anasazi. Construction of Pueblo Bonito, a previously unknown reservoir, and a possible New World ley line.

«California's Mysterious Oíd Stone Walls. New insights and an appreci- ation of their real extent.

aMiscellaneous Structures of Interest. North Carolina "standing stones," an ancient bridge in Texas.

NEW ENGLAND STONE STRUCTURES

New England is dotted with controvorsial stune chambers, cairns, and standing stones. Most professional archeologists write theru off as being of colonial origin. A large eadre of amateur archeologists, however, contend that some of these stone structures are Precolumbian and were constructed by varioua Oíd World cultures. (See Volume I.)

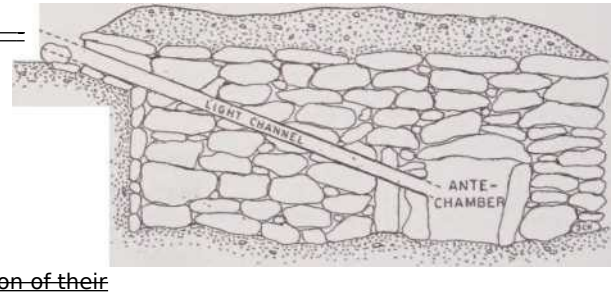
The Upton (Massachusetts) stone chamber described below is typical of the genre; it indeed does present 6everal anomalous aspeets, as does the Gungywamp (Connecticut) chamber illustrated below it.

IHD IRISH MONKS BUILD THIS NEW ENGLAND CHAMBER CIRCA 700 AI»?

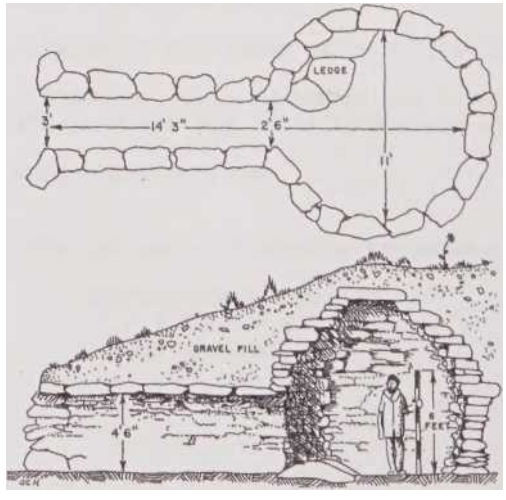
Curious stone chambers dot the New England countryside. Are they fdl potato cellars built by farmers? Most archeologists insist that they are. But some seem too sophisticated for such a mu ri- elarle application. üne of these problematic chambers is built into a hillside at Upton, Ivlassachusetts. J.W. Mavor, Jr., and B.E. Dix carefully measured and studied this chamber over a period of years. They give three reasons for as- serting that it was really built by Euro- peans around 700 AD—long before the Norse set foot on North America.

(1) The sophisticated corbelling of the structure closely íollows that seen in Irish and Iberic chambers, such as New Gran ge.

(2) The long passageway is aligr.ed with the summer solstice sunset, also a feature of some ancient European structures, but hardly of any concern to a New England farmer.



This remarkable stone chamber at the Gungyrwamp site near Groton, Connecticut, boasts u hyht pipe similar w principie to that at New Grange, Ireland, Sunlight streams into the chamber oniy at equinox sunsets, Thts similarity to a Neolithic European stone chamber strengthens the case for Precolumbian contacts. (From: Ancient Structures)



The dry masonry chamber at Upton, Massachusetts. (Adaptad from: ESRS Bulletin, 1:12, 1073)

(31 The Upton chamber seems to be assoeiated with linear arrays of stones and stone cairns on nearby Pratt Hill. These alignments have obvlous astronom- ical significance. In fact, based upon changes in tlie setting positions of seve- ral stars (due to precession), Mavor and Dix believe the whole eomplex dates back to 700-750 AD. They eonclude:

> **Of all the enigmatic structures that we have seen in America, the Upton chamber stands out ns one that could have been built uuder the inñuence of Irish monks in the 8th century.**

(Mavor, James W., Jr., and Dix, Byron ®.j "Earth, Stones. and Sky: Universal- ity and Continuity in American Cosmolo- gy." NEAR A Journal, 29:91, 1995.
NEARA « New England Antiquities Research Association)

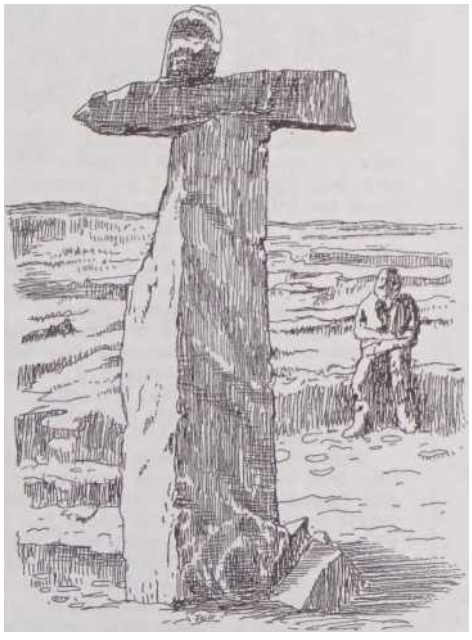
ENIGMATIC STRUCTIJRES IN THE HIGI1 ARCTIC

LEIF WAS LATE

It took clecades for a scientifie consensus ío emerge that the Norse did indeed establish a settlement at L'Anse aux Meadows, Newfeundland, circa 1,000 AD. Tiiís Viking outpost may have been only a short chapter in a long book on the Norae pre-Columbian presencc in North America. Mainstream archeologists con- temptuously dismiss the Kensington Stone, Rhorle Island's Newport tower, and those runestones from Qklahoma; but hard-to- cxpiain artifacts continué to crop up in the Canadian Arctic. Recently, there have been purported rivets from a Viking longboat and strand of Norse
yarn from the Arctic tundra-------the latter carbon-dated as 800 years oíd.

The Canadian Arctic is also the loca- tion of strange stone tuwers, stone foundations, and standing stones like that illustrated. Canadian author, F. Mowat, asserts that these strüclures in the far north are neither Eskimo ñor Viking in origir. In his new book, The Far tare rs, he elaims that sorae 200 years before the Vikings built L'Anse" aux Meadows, voyagers from northern Seot- lanú crossed the Atlantic in walrus-hide boats and established a colony in Newfoundland. Mowat bases his conjectures upon the strong similarities between the stone structures in the Arctic and those on the Orkney3 and other islands in tlie north of S eotland.

Quite understendably, the Icelanders, to whom Leif Ericsson is a national hero, greatly resent Mowat's theory.



This 10-foot-high standing stone is located near Ungava Bay, Quebec.
It is saiú to resemble the Norse Hammer- of- Thor motif. (Fromi Ancient Infra- structure)

(Nickerson, Colinj ''New Clues F,merge on Viking Voyages," Boston Globe, February 14, 200U. Cr. M. Colpitts.)

Comments, The same argument—similarity uf rude stone structures—is presented to "prove" that the hundreds of stone ohambcrs found in New England and New Vork were built by Precolumbian visitors from S eotland and Ireland.

Additional hints of early Norse activities in North America: the controversia! "muoring stones" and the so- caUed "coon cats" are introduced on DD.
5 and 53.

MIDWESTERN PRECOLUMBIAN WORKS

Midwestern North American was the focus of the Motuidbuilder cultures. The first European colonists found rnounds and other earthworks in profusión. There are also roacls, stone forts, and some curi- ous pit furnaccs in the same area. IVe are not certain who built some of these structures, espeeially the furnaccs, which may have been constructed by early European settlers.

HABD FACTS AT CAHOKIA

Monk's Mound, the largest mound at the Cahokia Mounds State Historieal Site, in Illinois, is not whnt it seems. Super- ficially, it is a terraced carthen mound 100 feet bigh and more than three foot- ball ñelds long What we now see of the mound was apparently constructed be- tween 900 and 1200 AD. The prevalling dogma has long been that the Indians who built Cahokia worked only with earth, never with stone. Indeed, suitable stone is scarce in the area,

On January 24, 1998, while drilling to construct a water dralnage system at Monk's Mound, workers hit stone—at least 32 feet of it—perhaps a región of cobbles or slabs of rock. This región of stone, of undetermined geometry, is located 40 feet below one of the terraee surfaces, but still well above the base of the mound. The stones could well be an artificial structure of some sort-

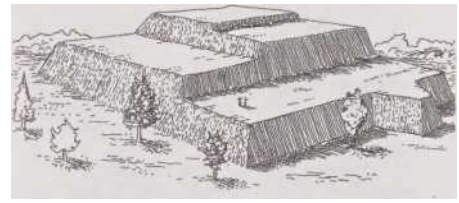
The diseovery challnnges the current thinking about the culture that built Cahokia. Only further researeh will re- veal the extent and conñguration of the stony región and where the stones may have come from.

An editorial in the March 14, 1998, St. Louis Post-Dispatch put the Cahokia diseovery in the largor context: New World urcheology is in flux. Humans oc- eupied the Americas long before 12,000 BP, and some of them may have been Caucasian (e.g., Kennewíek Man). We now quote two incisive paragraphs from this editorial.

> This burst of uncertainty surrounding the meaning of the stones beneath Monk's Mound is just the latest dis- covery shaking what was settied fact. Archeological finds are even challen- ging the conventional wisclom about when and how the Americas werc set- tied.

> It is a humbling and thrilling re- mínder that in all fields of human ín- ouiry, what we take for certain know- ledgc at one point in history is hii“h~ ly mutable, subject to continuous revisión, revolution and even rejection

(Alien, William; "Cahokia Mounds FInding Stuns Archaeologists," St. Louis Post-Dispatch, March 9, 1998. Cr. COUD-I)



Monk's Mound toda y as reconstructed

A DOWN SIDE TO MOÜNDBUILDING?

The thousands of carthen mounds and walis piled up basketful-by-basketful by Native Americans throughout the Midwest and, espeeially, Ohio, suggest only simple cultures that raised rude edifices and roonuments to their chiefs and gods. But now some anomalies have arisen from below the Midwestern soil.

Archeologists got a shock in 1998, when drillers installing a drainage system at huge, terraced Monk's Mound in Illinuis discovered that the mound was not all dirt after all. Some 40 feet below one of the terraces íhey ran into a 32- foot-thick layer of stones. Hidden for centuríes, no one knows the extent or purpose of this huge mass of stones.

Now, just 3 years later, scientists using magnetic and other noninvasive equipment have discerned a buried circle of "something" measuring 90 feet across. Like the stones in Monk's Mound, the find was entirely serendipitous. The lócale is Paint Creek Prairie, Rose Coun- ty, in Southern Ohio. There are run-of- the-raill mounds at the site but no one supposed there was anytliing of signifi- cance beneath the surface

(Sloat, Bill; "Mysterious Circle Found Buried beside Mounds," Cleveland Plain Dcaler web site, September 6, 2001.
Cr. P. Huyglie)

Commen*, The Hopewell Culture flourish- ed in this región from about 400 BC to 400 AD. In fact, they lield sway from the Great Lakes to the Gulf. Above ground, they left abundant mounds, earthen walis in various enigmatic geometries, and, o£ course, the Great Hopewell Road running 60 miles long through central Ohio. (p- 4)

Whe knows what else a culture of this power and sophistication might have built undergroundund are yet to be discovered?

THE GREAT HOPEWELL ROAD

Ancient peoples had a thíng about pro- cessional roads; that is, roads used for rítuuls rather than oommerce or simply getting frora one placo to another. In BrLtain, for example, there are the grand processional avenues at Avebury and the ionger, wider Icknield Way. In South America, the famed Inca roads were preceded by thoroughfares 100- feet wide that had no obvious practieal purpose. The hundreds of miles of unneeessarily straight roads leading to Chaco Canyon in New México seem to have been primarily for pilgrims making ritual treks to the great ceremonial complex in the canyon.

Did the Indians east o£ the Rockies construct special roads for ritual pro- cessions? We do know of the Mohawk Trail, the Virginia Warriors Trail, and other utilitarian roads through the wilderness.. And before the settlers plowed them up, there were travel-worn trails six feet deep in the earth of lowa. Now, we learn that, indeed, the Hope- well Culture may have built a long roed mainly for ritual processions.

It is called the Great Hopewell Road, and it is thought to have conneeted the Hopewell centers at Newarlt and Chilli- cothe---a distanee of 60 miles through the heart of Ohio.

In 1862, the first 6 miles of this controvorsial road, marked by parallel earthen banks, were surveyed by two brothers, C. and <J. Salisbury. They noted that the road extended much far- ther in the direction of Chillicothe.
R. Leppcr, a present-day Champion of the Great Hopewell Roud, claims that there are still traces of the road re- maining at four additionai places along the 60-mile Une connecting Newark and ChilUeothe. Skeptics do not question that the sophisticated Hopewell Culture (circa 400 B.C. to 400 A.D.) was capable of constructing such a road, ñor do they contest the 1862 survey covering the first C miles. They doubt the existence oí the last 54 miles.

(Hicks, Ronald; "The Great Hopewell Mystery," Archaeology. 52:76, Novem- ber/Decembcr 1999.)

ILLINOIS'S ANCIENT MAGINOT LINE

Mainstrcam archeologists rarelv mention the 100-inile-long string of stone forts and walls that stretch across Southern Illinois. Between the Ohio and Mississíppi rivers, fortified hilltops protected an un- identified population against some very real threat. The tlireat had to be dire to induce men and women to drag innumerable largo stones from the river bottoms to their present elevated positions.

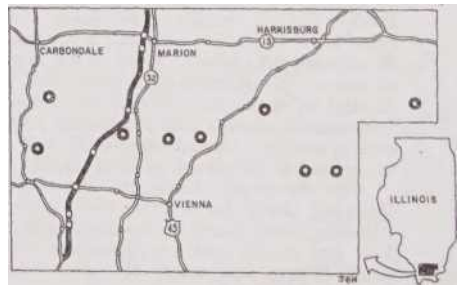
In the latest Issue of Ancient American, W. May elaborates on this impressive defensa Une. He focuses on the seetion called the Lewis Wall near Makanda.

> The Lewis Wall biseets the top of a steep cliff, running on a linear east- west axis for 285 feet. Six feet high at its highest point, with an average thickness of five feet, tbe strueture is a dry stone rampart containing an estimated forty íhousand stones, aU oí them apparently eonveyed bj[T] hand up the sheer incline from the dry stream- bed two hundred feet below. Stone cairns, or ceremonial rock piles, ap- penr at the rear entrance. The strueture was raised ingeniously by fitting together mostly fíat stones chosen for modérate size and a rough although uniform fit, the same technique used in building the other wulls-

Of course, many stones in the Illinois stone walls have long ago been appropri- ated by European settlers. Some walls were once six to ten feet high and in length extended up to 600 feet. Organic material lodged in the walls yield a wide range of Precolumbian radioearbon dates; e.g., 50, 400, and 900 A.D.

(May, Wayne; Stone Walls of Southern Illinois," Ancient American. #50, p. 3, 2003)

Comment ■ The wide span of radioearbon dates poses a problem: It seems unUkely that the Illinois walls were built over a period of nearty 900 years. Undoubtedly, some of the quoted dates are incorrect.



Locations of some of the enigmatic stone structures distributed east-west across Southern Illinois. Most were probably forts. The Lewis Wall is tocated at the aírele south of Carbondule. (RecirciWTi from NEARA Newsletter, 5:68, June 1971. DE ARA = Ñew h'ngland Antiquities Research Association)

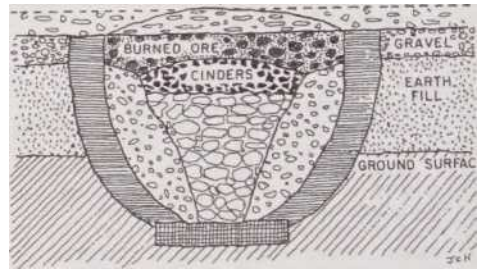
DEFLATING AN ANOMALY: OHIO'S IRON P1T-FURNACES

The claimed anomaly: some 33 sites have been found in soutb-central Ohio where iron was apparently smelted before the región was settled by Europeans.

The observables are robust and sug- gestive:

- «.Oval-shaped, fire-reddened areas
- •Green glazed siag
- •Red baked clay
- •Glazed and unglazed bricks
- •Charcoal and Unte residues.

BROKEN STONES
^ANü SLAG



Secfion of one of the llaskins iron pif furnaces in Ohio, as conceíved by A.H. Mallery. (Redrccwn from The Rediscovery of Lost America)

Today's establishment archeologists have shown scant interest in these sites, deeming them to be merely the works of early settlers—a not unreasonable pre- sumption in the absence of accurate dating of the pits.

An extreme claim of anomalousness was put forth by A. Mallery in bis 1951 book Lost America (revised in 1979 with the titl< The Rediscovery of Lost America.) Mallery had explored several of the fire-altered sites and announced that they were the work of Vikings and Celts who penetrated this wilderness centurias before Columbas landed.

This interpretation fits neatly with Mallery's diseovery of the famous Piri Re'is map (upou which C.P. Hapgood based his influential Maps of the Ancient Sea Kings). In both the supposed ancient iron smelters and the Piri Re'is map, Mallery and Hapgood saw evidence for an ancient sea-going culture that made the world's oceans their thoroughfares.

Oí course, B. Fell's ever-controversial decipherments of innumerable New World inscriptions in his America B.C. ndded to this far-off-mainstream perception of frequent European visits to America thousands of years ago.

Unfortunately, modern dating of the Ohio iron smelters, using radioearbon and thermoluaiinescence metbods, have pulled this prop out froin under the visión of ¡i thriving ancient transocean commerce. The Ohio furnaces are now dated to the 1600s and 1700s—much too late for tho.se "ancient sea kings."

Nevertheless, these dates are so early that they pose another niyster*y: Who really did construct these iron smelters and why? In 1700, Ohio was still a vast heavily forested wilderness claimed by both England and Franco and virtually devoid of settlers.

(Conner, William D., et al; "The Fnig- natic Iron Pit Furnaces of South-Central Ohio," Midwestern Epigraphic Journal, 9:67, 1995)

Comment. See the following Ítem on ancient copper mining in North America. Jt also bears on the "ancient sea kings" thi ¡me.

ANCIENT COPPER MINING AROUND LAKE SUPERIOR

The priman anomaly here is the seem- ing disappearance of hundreds of thou- sands of tons of copper apparently mined thousands of years ago.

Just who mined this metal or who directed the mining and transportation out of North America eonstitutes the second anomaly.

MISSING: 500,000 TONS OF COPPER

For some 1800 years, beginning abruptly about 3000 BC, some industrious peo- pies mined ore equivalent to 500,000'"'' tons of copper from Michigan's Isle Royale and Keweenaw Península. Who were these mysterious miners, and what happened to all all that copper?

It certainly hasn't been found in the relies of North American Indians. And where was the ore smelted? About all the unidentifled miners left behind are some of the crude tools they used to pound out chunks of ore from their pit mines (5000 pit mines on Isle Royale alone). Outside of some cairns and slab- rock ruins, there is little to help pin down these miners. Mainstream archeolo- gists attribute all these immense labors to a North American "Oíd Copper Culture" ----------certainly not to copper-hungry visitors from foreign shores. Admittedly, many copper artifaets have been dug up from North American mounds, but only a tiny fraction of the metal the Michigan mines must have yielded.

Both shaded areas are marked by thousands of pits and strewn with hundreds of thousands of hammerstones. Some estímate that the mining began as early as 5000 B.P.!

Curiously, North American Indian mounds have contained copper sheets ma le in the shape of an animal hide. Called "reels," their function, if any, is unknown. The reels do, however, resemble oddly shaped copper ingots common in European Bronze Age com- merce. Their peculiar shape earned these ingots the ñame "oxhydes." They have been found in Bronze Age ship- wrecks, and are even said to be por- trayed in wall paintings in Egyptian tombs. The standardized híde-like shape, with its four convenient handles, was useful in carrying and stacking the heavy ingots. Could the reels from the North American mounds have been copied from the oxhydes? It is tempting . to speculate (as we are wont to do) that the Oíd Copper Culture miners were actually Europeans, or perhaps Native Americans employed or enslaved by Europeans an ornen- of future, more devas-
tating invasions!

(Sodders, Betty; "Who Mined American Copper 5,000 Years Ago?" Ancient American, 1:28, SeptemDer/October 1993.)

Comment. The Ancient American is a relatively new, off-mainstream areheo- logieal serial. It will be interesting to gauge its impact on prevailing paradigms!

A grooved stone maul used by ancient miners to break up the rich copper ore. Some relatively puré copper masses weighed almost 50 tons! (S. Bráker)

UNEXPLAINED TRIANGULAR HOLES IN BOULDERS

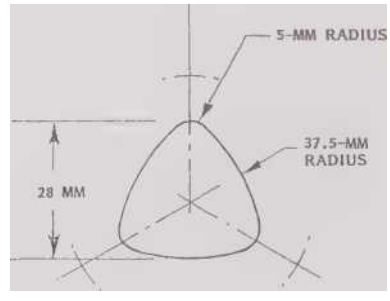
TRIANGULAR HOLES IN BOULDERS

Recently, someone who wishes to remain anonymous, inspired after reading our Ancient Man, wrote us about a curious discovery of his. He had found some triangular holes in a granite boulder near Raleigh, North Carolina. We have mentioned similar triangular holes before (vol. 1, p. 20), noting that hundreds of such holes have been recorded in boul- ders from Minnesota and the Dakotas to the eastern seaboard. We can now add to this dossier a photograph supplemented by this individual's testimony.

Soon after Furricane Fran p.truck Raleigh in September 1996, I was walking one of my customary routes along a local creek when my attention was arrested by a i- ton granite boulder in the creek bed. The boulder had 3 holes drilled in its face, about 6 inches apart, and all in a straight line. (See photo.) I had not

Three "trianguloid" holes drilled in a boulder found in a North Carolina streambed. Photographed from 10 feet. Scale length: 13 inches. Why three holes in a row? Hardly a mooring stone!

noticed this boulder before, so I'm fairly confident it was uncovered by the storm's 10-inch deluge of rain. Because the three holes seemed too cióse together to be blasting holes, I took a closer look at them and was surprised to see that they had "trianguloid" cross sections rather than round ones. By "trianguloid" I mean the cross section was thus:



Cross section and typical dimensions of the triangular holes found in some North American boulders. Note the usual rounded corners and curved sides. So far, the drillers and purpose of these holes are unknown.

Casts of the holes were made by using modeling clay. The expanded bases of the casts suggest that a shallow pit was pecked out of the granite before drilling began, and the constricted tips show that the first 3/4 inch of the drill bit was of a smaller diameter, perhaps to give it greater penetrating power so that the holes could be started more easily.

The smaller "pilot" holes were aiso trianguloid in cross section.

(Anonymous; personal communication, May 27, 1997.)

Comments. In vol. 1, it was proposed by one avant garde areheologist that the triangular holes were made in that shape so that wooden shafts, also of triangular cross section, could be inserted, given a quarter turn, thereby wedging the shaft firmly in place. This idea is behind the popular speculation that these holed boulders are really ancient "mooring stones." And given their distribution, they were probably Viking mooring stones! In truth, no one really knows how oíd they are and what their purpose was. The final explanation may be mun- dane and/or trivial. We do not even know if the Vikings regularly used such mooring stones in the Oíd World.

THE VIKING MOORING-STONE SAGA SAILS ON

One of the more fascinating types of North American artifacts is the so-called __ Viking mooring stone. It has been impos- sible to ignore them in past issues of this newsletter. The preceding entry displays a photograph of three of the unique triangular holes characteristic of the "mooring stones" drilled into a boul- der resting in a North Carolina stream bed. North Carolina is hardly Viking country no matter how receptive you are to claims of an early and extensive Norse presence in North America. After all, the interior of North Carolina is hundreds of miles from L'Anse aux Mea- dows, Newfoundland, and nowhere near the site of the infamous Kensington Stone in Minnesota. Yet, several hundred of these "Viking" mooring stones have been found all the way from Cañada south to Missouri. Most, however, seem to be clustered in Minnesota.

For those unfamiliar with this unusual artifact, it is the curious triangular holes that are diagnostic of the Viking mooring stones. These holes are essenti- ally identical everywhere: an inch across, 4-5 inches deep, triangular in cross section, with neatly rounded corners.
The saga is reviewed in our catalog Ancient Infrastructure.

Our purpose here is to flag a recent article in Ancient American that tells of the discovery of still more of the Viking mooring stones in Minnesota, especially in Pope County. The most interesting feature of this article is the map of Pope County giving the locations and approximate elevations of more than a score of the stones. All lie between 1,100 and 1,400 feet. While small lakes exist at these elevations, the stones are all more than 500 feet above Lake Superior. If the Vikings did somehow penétrate into the Great Lakes (perhaps via Hudson Bay or the St. Lawrence), how did they ever raise their vessels 500+ feet to levels of the supposed mooring stones?

There must be a better explanation for this ubiquitous phenomenon.

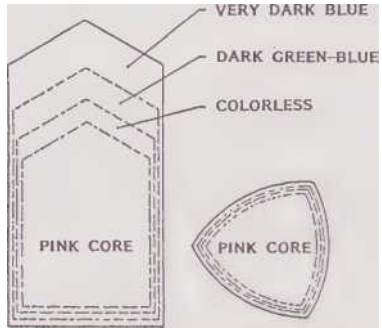
(Pederson, Leland; "Viking Mooring Stones in West Central Minnesota," Ancient American, no. 33, p. 25, 2000.)

Comment. Stacked against the Viking- . mooring-stone theory are the stones' r presence far inland and at high eleva tions, as alluded to above. Yet, the unusual cross section of the holes, their precisión manufacture, and standard dimensions militate against the blasting- hole theory proposed by skeptics.

ONE POSSIBLE EXPLANATION OF THOSE TRIANGULAR HOLES IN BOULDERS

One geologist suggests that these puz- zling holes may actually be left behind when tourmaline crystals, which have a unusual triangular cross section, are weathered out of boulders. See sketch.

(Saúl, J.M.; personal communication, November 1, 1997)



Sections through a multi-colored *tourmaline* crystal.

SHELL AND MOUND RINGS IN SOUTHERN STATES

SHELL RINGS OF SOUTHEASTERN NORTH AMERICA

The ancient inhabitants of coastal South Carolina, Georgia, and Florida, with few stone quarries at hand, utilized an un usual structural material: sea shells. These they had in great abundance; and they were large in those days oysters 14 inches long! Rather than randomly discard the remnants of their major pro- tein sources, the Native Americana of 6,000 years ago deposited the empty ^ shells in circles. Not little áreles, mind you, but truly impressive structures. The shell rings of South Carolina and Georgia are 3 to 10 feet high and up to 250 feet in diameter. But farther south, on the east coast of Florida, were the biggest shell rings. M. Russo and G. Heide wrote of them in Antiquity recent- iy.

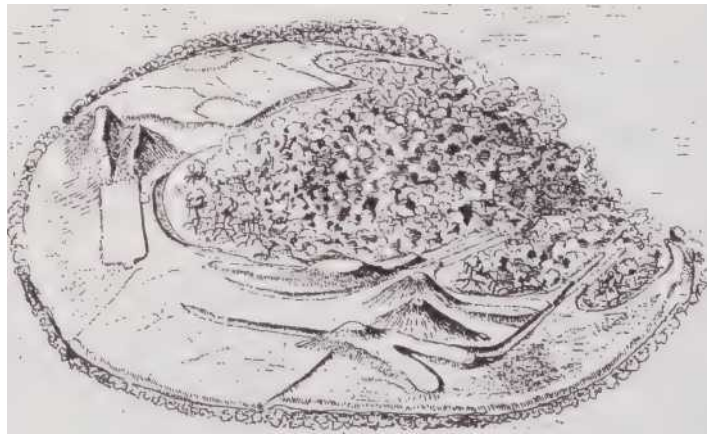
> Recent work at six sites has shown that shell rings in Florida are as tall (1-4 m) [3-13 feet], but larger (150250 m across [500-825 feet] and more structurally complex than those found in Georgia and South Carolina. At 4600 BP, Oxeye is the oldest. It lies half-buried beneath a salt marsh and predates the local invention of pottery by at least 100 years. Located high and dry on a nearby barrier island, Rollins shell ring dates to 3700 BP and is unusual in that numerous smaller 'ringlete' are attached to its main ring.

On the southwestern coast of Florida, archeologists have found two U-shaped "rings" that are assoáated with ceremonial mounds.

It seems that Native Americana were building Bhell rings about the same time as the British were raising Stonehenge and other stone circles. (Shell Age vs. Stone Age!) The shell rings preceded the inland North American Moundbuilders by several millennia. In fact, the only recognized North American structure of comparable age is that strange ring of mounds at Watson Brake, Louisiana.
(See next entry.)

The real purpose of the shell rings is unknown. Guesses inelude gaming areas, fish traps, and astronomical ob- servatories. Perhaps they served ritual purposes like the contemporary stone circles in Europe.

(Russo, M., and Heide, G.; "Shell Rings of the Southeast US," Antiquity, 75:491, 2001.)



A ring-shaped shell k.ey in Pine Island Sound, Florida. Note the sea watt, which is also composed almost entirely of discarded shells. (From: Ancient Infrastructure)

Comments. Curiously, the authors failed to mention tile more impressive shell mounds and shell keys on the west coast of Florida. At Crystal River, one flat- topped shell mound reaches 90 feet high. (MSM1 in Ancient Infrastructure) The shell keys (MSM2) are complete islets built mostly of shells, with sea walls, internal canals, flat-topped mounds, and terraces.

ABOÜT AS ANOMALOUS AS MOUNDS CAN GET

The title refera to a circle of 11 earthen mounds located new Monroe, Louisiana; the Watson Brake site. Local residents nave known about the mounds for years, but archeologists weren't attraeted to them until clear-cutting of the trees in the 1970s made the size and novelty of Watson Brake all too obvious.

Just how anomalous is Watson Brake? Archeologist V. Steponaitis, from the University of North Carolina, opined:

> **It's rare that archaeologists ever find something that so totally changes our picture of what happened in the past, as is true for this case.**

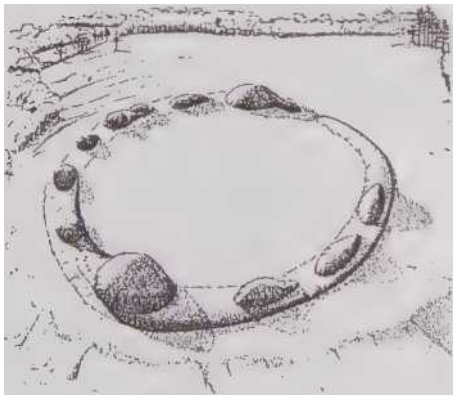
On what does Steponaitis base such a powerful statement?

(1) Watson Brake is dated at 5,0005,400 BP (Before Presentí', some three millennia before the well-known Mound- builders started piling up earthen struc- tures from the Mississippi Valley to New York State. In other words, the site is anomalously early.

(2) Indications are that Watson Brake was built by hunter-gatherers, but no one really knows much about them; there's an aura of mystery here.

(3) Watson Brake consiste of 11 mounds----some as high as a two-story house- -connected by a peculiar circu lar ridge 280 meters in diameter. The back-breaking labor required to collect and pile up all this dirt is incompatible with the life style of mobile banda of hunter-gatherers.

(4) The purpose of the Watson Brake complex escapes us. Why the mounds? Why the circular ridge? Can we just shrug it off as a "ritual site"?



The mysterious ring of mounds at Watson Brake, Louisiana. These mounds may be 5,000 years oíd. (Smithsonian Institution)

(Saunders, .Toe W., et al; "A MounA Complex in Louisiana at 5400-5000 Years before the Present," Science, 277:1796.
Also: Pringle, Heather; "Oldest Mound Complex Found at Louisiana Site," Science, 277:1761, 1997. Also: Stanley"
Dick; "Finds Alter View of American Indian Prehistory," Austin American Statesman, September 19, 1997. Cr. D. Phelps.)

Comment. If you followed the archeologi- cal news stories of 1997, you probably noticed three Ítems that seem destined to "revolutionize" the prehistory of the Americas: (1) The Watson Brake site (above); (2) The Monte Verde site in Chile (more than 12,500 years oíd) on p. 25; and (3) The Kennewick Man story (a Caucasoid skeleton 9,300 years oíd in North America on p. 47.

ENGINEERING WORKS OF THE ANASAZI

The Anasazi flourished in the North American Southwest circa 900-1150 A.D. They built the giant complex of buildings at Chaco Canyon, New México, as well as the curious system of roads leading to this site.

During the decade 1994-2003, three Ítems relevant to their engineering pro- wess appeared in Science Frontiers.

WHENCE THE 200,000 LOGS OF CHACO CANYON?

Previously (vol. 1, p. 7), we introduced readers to one of the many mysteries of New Mexico's Chaco Canyon; namely, the unknown source of the huge numbers of logs required to roof the many struc- tures in this fantastic complex. (Pueblo Bonito alone eontains some 600 rooms!)
As many as 200,000 pine and fir trees had to be cut down and transported as much as 50 miles, for no sizable trees grow near Chaco Canyon today. There is no consensus as to where all these trees were felled.

S. Durand, an archeologist from Eastern New México University, Portales, has developed a technique for identify- ing the sources of logs. He tries to match trace elements in the Chaco Can- yon logs with those in living trees in today's forests. The different bedrocks underlying the varioús forests supply different quantities of such trace elements as barium and manganese.

Preliminary results suggest that the early building period in Chaco Canyon, circa 900 AD, employed trees from many different sites. During the peak building period a century later, all logs used carried the same concentrations of trace elements and, therefore, probably carne from the same forest. Durand's next step is to lócate this forest and figure out how the builders of Chaco Canyon, the Anasazi, managed to tote the logs, some weighing 600 pounds, 50 miles or more.

(Mestel, Rosie; "Where Did Desert Builders Get Their Wood?" New Scientist, p. 10, August 6, 1994.)

AN ANASAZI LEY LINE?

A popular archeological pastime in Bri- taín is "ley hunting" or the search for alignments of ancient sites. The underlying premise is that the peoples who constructed Stonehenge, Avebury, and other megalithic sites had a penchant for aligning them, even when they were separated by many miles. Exactly why anyone would wish to go to such trouble escapes the modern mind.

American archeologists generally eschew ley hunting, but S. Lekson, from the University of Colorado, was surprised to find that three important Anasazi sites in the Southwest are actually aligned with high precisión along Longitude 107° 57'. The three sites are: Aztec Ruins and Chaco Canyon (New México) and Casas Grandes (México) . Even though the first and last are separated by about 450 miles, all sites are within 1 kilometer (5/8 of a mile) of the north-south line. Lekson maintains that an aügnment this precise cannot have happened by chance.

How could the Anasazi have achieved such an aecurate aügnment over such rugged terrain? It would not be easy even with modern transits.

These three major Anasazi sites are lined up precisely north-south. Was this intentional—like the so-called "ley line s" of Euro pe?

(Cohén, Philip; "One Dynasty to Rule Them All," New Scientist, p. 17, Decem- ber 14, 1996.)

Comment. It is interesting but perhaps not relevant that the Olmecs, predeces- sors of the Anasazi farther to the south, may have possessed the magnetic compase. See: Carlson, JohnB.; "Lodestone Compass: Chínese or Olmee Primacy?" Science, 189:760, 1975. (See discussion In our Archeological Anomalies: Small Artifacts ■)

AN ANASAZI RESERVOIR

In Morefield Canyon, Mesa Verde National Park, Colorado, a strange earthen mound, 200 feet wide, rises 15 feet above the canyon's grassy floor. Arche- ologists have debated the mound's pur- pose for decades. Being elevated above the floor of a usually dry canyon as it is, the mound certainly does not seem to be a reservoir, but that is what recent research says it is.

The mound is shaped like an inverted frying pan, with a 1500-foot-long handle that leads to a normally dry stream bed higher up in the canyon. The Anasazi were excellent water managers and took advantage of the flash floods that roared down the canyon every few years. To impound some of this valuable water, they initially built a conventional reservoir, but it was soon silted up by the freshets. So, they gradually raised the reservoir walls and constructed a raised canal to the stream bed. It was all very logical.

The engineering of the canal is parti- cularly impressive. The channel is 4-8 feet wide, but only 1-2 feet deep. Its steep, 15-foot-high sides are shored up with neatly aligned stones that were carried in from somewhere outside the canyon.

(Anonymous; "Mystery Mound Appears to Be an Ancient Reservoir," San Francisco Chronicle, June 6, 1997. Cr. D. Phelps. Also: Anonymous; "Mysterious Mesa Verde Mound Turns Out to Be a Reservoir," Deseret News,. June 10-11; 1997. Cr. S. Jones.)

Comment. The closely related Hohokam Indlans built miles of well-engineered canals where Phoenix now stands. See vol 1, p. 6 for a map and description.

CAUFORNIA'S MYSTERIOUS OLD STONE WALLS

The "Berkeley walls," sometimes called the "East Bay walls," form only one of several groups of oíd stone walls that California archeologists have not fully explained as to their origins and their builders. Other walls exist out on Point Reyes, near San Diego, and probably elsewhere still unnoticed.

THE BERKELEY WALLS EXTENDED

For almost two decades, R. Swanson has been searching out the enigmatic stone walls that festoon the Berkeley Hills and beyond, far beyond, it now seems. We first mentioned these walls and provided a photograph back in 1985. (vol 1, p. 7). Since then, Swanson's labors have re- eeived a modicum of public notoriety but hardly a flicker of academic interest.
One reason for professional disinterest seems to be that grant money for ex- ploring oíd walls is nonexistent!

To bring new readers of Science Frontiers up to speed on these particular perplexing California walls, we quote two paragraphs from a recent article by Swanson.

Six-foot wáll of unexplained origin in Southern Alameda County, California. This section of the complex is 2 miles long. (R. Swanson)

On the crest of the Berkeley hills there is a long line of large rocks, some are three feet in length, they may weigh a half ton. A century ago they ran for miles on these dry, wind-swept crests then down in a line to what is now the botanical gar- dens.

In the past twelve years, I have visited over forty miles of these stone structures. To cali them walls is something of a misnomer. Some do go in a straight line, others twist like a demented snake up a steep hillside, others come in a spiral two hundred feet wide and circle into a boulder with a six-inch knob carved on the top of it. Some are massive, over six feet tall and run for miles.

In the same article, Swanson relates how a local TV station that wanted to film the walls took him for a helicopter ride. As expected, all along the East Bay hills they discerned line after long line of walls. Then, when the copter passed over Mission Peak toward Mt. Allison, mile upon mile of still more walls appeared. Numbed by these new discoveries, Swanson remarked:

I could see years of Work just laying there waiting for me.

(Swanson, Russell; "The Berkeley Walls and Other Enigmas," Bay Área Rock Art News, 15:7, June 1997.)

Comment. No, the Berkeley walls are not like those piled up by New England farmers and eulogized in Robert Frost's poem. The California walls are said to be pre-Spanish. They certainly don't have any military valué. Who knoWs what they were built for?

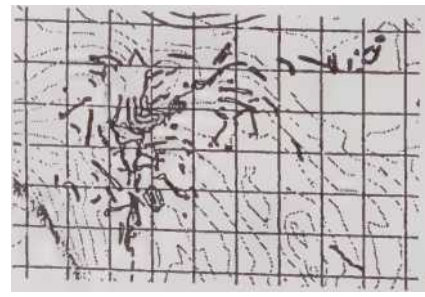
MISCELLANEOUS STRUCTURES OF INTEREST IN NORTH AMERICA

THE MOS1ER MODNDS

The western States are festooned with curious stone structures, such as the Berkeley walls (mentioned above) that stretch for some 50 miles along the foothills bordering San Francisco Bay. Also, there are the strange, meandering stone lines of the Panamint Valley near Death Valley (p. 39). Now we add the Mosier Mounds to this file.

On the south bank of the Columbia, near Mosier, Oregon, archeologists have mapped a 30-acre complex of rock walls, cairns, pits, and troughs—a vertiable maze of lithie structures. (See map.)

The most impressive features are alignments of stacked rocks that hug the contours of the slopes. Although their configuration suggests a battlement, the stone formations weave so sinuously that they cannot be defensive in nature. Some anthropologists suggest that these various lithie structures were used for burials, visión quests, and even the physical conditioning of the young men who were given the job of piling up all the stones!



Mounds. The heavy lines represent ti stacked rocks. The grid squares are meter,s on a side.

No precise dates are available, but tbe Mosier Mounds probably predate European contact.

(Connolly, Thomas J., et al; "Mapping tbe Mosier Mounds: The Significanee of Rock Feature Complexes on the Southern Columbia Plateau," Journal of Archaeological Science, 24:289, 1997.)

ELMAINS OF AN ANCIENT BRIDGE

In Galveston Bay, Texas, the timbers of an oíd bridge were found under 15 feet of sediment. A great divergenee of opinión prevails here, but some claim the bridge was built by Romans!

(Lee, Victoria; "Professor Explores Theory of Romans' Aneient Voy age," Dallas Morning News, June 13, 1993.
Cr. T. Adams via L. Farish.)

STANDING STONES IN NORTH CAROLINA?

A North Carolina reader recently sub- mitted the accompanying photograph of very large, vertically oriented stones that if found in western Europe, would be quickly assigned to the megalithic culture. Although similar upright stones are known in New England,- we have not he ird of any in North Carolina before.

The stones in question are located in the Boone/Blowing Rock región of western North Carolina near Foscoe, very cióse to Grandfather Mountain (5964 feet, and one the higher peaks east of the Mississippi).

Although they could well be a product of natural forces, these stones stand out like the proverbial "sore thumb."

(Davant, Charles, III; personal Communications, July 2 and August 18, 1997.)

A row of three, huge, erect, isolated stones in western North Carolina. (C. Davant)

THIS IS A GOOD PLACE FOR A CAVEAT

The foregoing 5-ems from Science Fronfiers concerning possible Precolumbian and Pre-Clovis contacts with North America are generally not part of main- stream thinking in archeology. To empha- size the existence of this intellectual- belief dichotomy, we inserted the follow- ing digest in Science Frontiers over a decade ago. It is still relevant and also applies to most of the entries that follow in this volume.

VOYAGES OF THE IMAGINATION

We would be remiss if we did not record here an article by F.J. Frost, a professor al tile Universa of California at Santa Barbara. Frost proceeds to shoot down all daims, save one, of Precolumbian contacts with the New World. He accepts only the Viking signs found at L'Anse aux Meadows in northern New- foundland, dating back to about 1000 AD. Everything else: Román amphorae in Brazil, Japanese pottery in Ecuador, Egyptian architecture in Mesoamerica, Celtic inscriptions in New England, etc.; is the product of hoaxes, misinterpreta- tions, and sloppy archeology. Frost has no patience with the (mainly) amateur archeologists; he is not impressed by all the mountains of evidence they have collected.

(Frost, Frank J.; "Voyages of the Imagination," Archaeology, 46:46, March/April 1993.)

Comment. Frost's stonewalling reminds one of other negative pronouncements, such as: "Stones cannot fall from the sky"; and "Continents cannot drift."

MESOAMERICA

A PURPORTED DROWNED CITY AND A REMARKABLE BRIDGE

THE DROWNING OF ANCIENT LANDS

Off Guanahacabibes Península. The waters off this western tip of Cuba are said to eover a "lost city" built by an "unknown civilization." We have heard these words so many times before that we must be wary.

This lost city is said to be 6,000 years oíd, but the dating methods are not provided. Its depth is 650 feet, making archeological study difficult.
The researeh is being conducted by ADC (Advanced Digital Communication), a Canadían outfit, aided by a Cuban part- ner and the Cuban Academy of Sciences.

In July, 2000, ADC researchers, using sophisticated side-scan sonar equipment, identified a large underwater plateau with clear images of symmetrically organized stone structures that looked like an urban development partly covered by sand.

From above, the shapes off the Guanahacabibes Península on the Caribbean island's western tip resembled pyramids, roads, and buildings, they said.

The Canadian-Cuban consortium sent down a small, unmanned submarine to film this promising area, which stretched for 20 square kilometers. The images revealed huge, smooth, "granite-like" blocks 2-5 meters in length incorporated in structures up to 400 meters [1300 feet] long and 40 meters [130 feet] high! A resemblance to Mayan and Aztec architecture was noted. Some still photos clearly showed "symbols and inscriptions ."

(Cawthorne, Andrew; "Canadians Find 'Lost City' off Coast of Cuba," National Post (Edmonton), May 28, 2001. Cr. G. Conway via L. Farish. Cawthorne, Andrew; "Explorers: Ruins May Be 'Lost City,"' Houston Chroniele, December 7, 2001. Cr. D. Phelps. Posner, Michael; "Aneient City Discovered Underwater near Cuba," Arkansas Democrat-Gazette, December 8, 2001. Cr. L. Farish)

Comments. If these are truly ruins, they may predate the Maya and Aztecs by several millennia. The builders of the Great Pyramid hadn't even sat down at their drawing boards 6,000 years ago! The above-mentioned stone blocks remind one of the blocks in the Bimini "road"; but they are at scuba-diver depths.

Two other drowned cities of consequence have been reported recently: one off the coast of India (p. 20); the other off the Pacific Island of Yonaguni (pp. 22-23).

A REMARKABLE MAYAN SUSPENSION BRIDGE

We tend to think Mayan engineering only in terms of those impressive pyramids at Tikal, Copan, and many other sites, but they were accomplished builders of roads and bridges, too.

Scientists working at the Mayan ceremonial center of Yaxchilan, México, have discovered the remains of a sophisticated 600-foot-long suspensión bridge built in the seventh century A.D. The bridge, which spanned the Usumacinta River, had massive concrete piers, a rope-cable suspensión system anchored to stone mechanisms, towers, and a bed of hard wooden planks. It probably stood for 500 years above water 40 to 150 feet deep, with a steady current of 5 to

7 m.p.h., which increases to 10 to 15 m.p.h. at flood stage. Civil engi- neer and archeologist Jame O'Kon says the bridge was the world's longest until 1377, when a larger one was built in Italy.

(Anonymous; "Mayan Suspensión Bridge," INFO Journal, no. 73, p. 44, Summer 1995. Source cited: Washington Times, February 26, 1995. INFO = International Fortean Organization)

Two issues of Science Frontiers later, we acquired a technical article on the purported bridge plus a drawing of what it might have looked like. Here follows the text of that addendum.

We hardly need more than the aceompany- ing drawing to amplify our brief İtem above on that remarkable 7th. Century Mayan suspensión bridge at Yaxchilan, in México. Its three spans stretched 600 feet. The wooden deck was 10 feet wide and was suspended by large-diameter hemp ropes---probably bundles of six 1-inch ropes, according to modern calcu- lations. The towers of the two bridge piers were 35 feet across and built up from large, flat stones (4x4 feet) set in bedrock. European engineers did not " build a larger bridge until 1377! The following reference contains much more information.

(O'Kon, James A.; "Bridge to the Past," Civil Engineering, p. 62, January 1995. Cr. S. Jones)

Comment. One wonders why such a talen- ted society collapsed so suddenly!

ANCIENT STONE ROAD LEADS TO MODNTAIN LACED WXTH JADE

The venue is Guatemala, where high in the jungle-clad mountains a newly-found stone road runs for miles. This road is a significant addition to Chapter MSR in our catalog Ancient Infrastructure. There. we described some remarkable Mayan roads and causeways but did not know then about this mountain road-----and undoubtedly other roads still hidden.

Actually, this new road eould be of Olmec construction for its leads to a región were a mountain is laced with veins of blue jadite, the Olmec's favorite gemstone. But the Maya favored jade, too, so they may also have been the ancient road-builders and jade miners.

For many years, archeologists have wondered where the Olmecs and Maya obtained all their jade, for only skimpy sources of this rare mineral eould be found in Central America. In fact, this apparent scarcity of New World jade led to the surmise that the mineral so com- mon in Olmec and Mayan jewelry had been carried across the Pacific millennia ago by Asiatic voyagers. The dearth of New World jade was an argument for early Pacific crossings.

But in 1998 a fierce storm lashed Central America precipitating floods and landslides. Jadite was afterwards found in the rocky debris carried down some of the region's rivers. Prospectors then worked their way upstream and finafiy carne across the mother lode, which is said to rival Rhode Island in extent. There, too, were the ancient jadite mines worked for centuries by.. .someone.

These mines showed ampie evidence of intense mining about a thousand years ago. Thus has been solved the mystery of the New World source of Olmec and Mayan jade.

(Broad, William J.; "Found in the Guate- malan Wilds, Jade Lode as Big as Rhode Island," New York Times, May 22, 2002. Cr. D. Phelps.

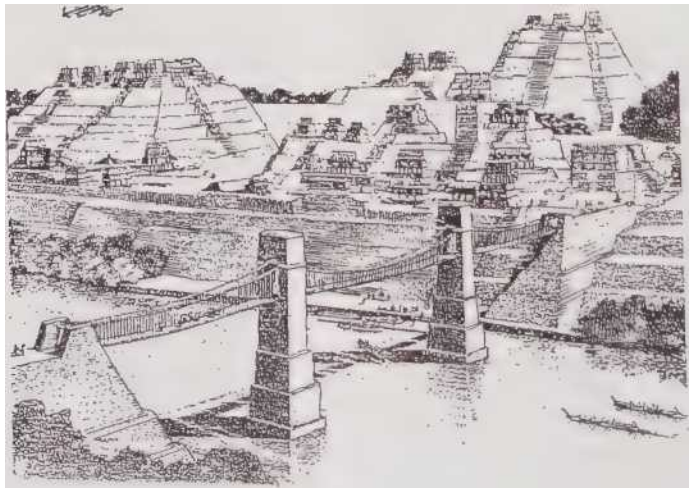
Comments. The Olmec culture displays other Asiatic affinities, although we must now delete jade obtained from the Orient from the list.

If a long stone road and a jade lode the size of Rhode Island have been hidden by Central American jungles all these years, it is likely that other archeologi- eal surprises are still in store for us.

SOUTH AMERICA

~~An ¡mmense area of South America has been relativeiy ignored by the archeologists who have focussed on the works of the inca, the Moche, the Nazca, etc. in an effort to compénsate in part, we present a rather substantiai treatment of the Amazon "earth-movers.:~~

- ~~•The Earth Movers of the Amazon. The canals, causeways, fish farms, térras pretas, etc.~~
- ~~•South American Monumental Architecture. The Cara! site, the wall at Ollantaytambo.~~



The purported Mayan suspensión bridge at Yaxchilan, México. Suspected temples and other city buildings are shown in the background.

THE EARTH-MOVERS OF THE AMAZON

EARTH-MOVERS OF THE AMAZON

In South America, most archeologists gravitate to the highlands of the Andes to study the grand cities, roads, and geoforms constructed by the Inca, the Nazca, the Tiahuanacans, and other ancient cultures. Many coffee-table-type volumes are fiüed with glorious color photos resulting from such research. Much-too-neglected is the Amazon Basin. The belief is widespread that there is nothing of great archeological importance there—just oppressive jungle, biting bugs, and primitive tribes. That there is much of scientific significance hidden under the lush greenery is just now being realized.

For example, A.C. Roosevelt has al- ready proven that surpringly advanced cultures did inhabit the Amazon Basin for thousands of years. (p. 26) We are

r'ow Jf'arning that some of these Amazon peoples were extraordinary earth-movers. Having little stone to work with, they matched the achievements of the Inca in the mountains just to the west with many miles of earthen causeways. Canals just as long were dedicated to fish-farming. Huge mounds rising ahove the flood plains supported villages.

Even the mounds hold mysteries. One of them, named Ibibate, has been de- scribed by anthropologist W. Balee as being:

> ... as cióse to a Mayan pyramld as you'll see in South America.... Be- neath the forest cover is a 60-foot [18-meter] human-made artifact.

Ibibate is only one of many sueh mGunds in the Bolivian Amazon. Called "lomas", they are obviously quite dis- tinct from any Mayan pyramid we know of. Rather, the lomas are enormous ísiands of pottery sherds mixed with black soil. Hundreds of these mounds prove that a large population once oeeu- p.sd this región of B Olivia called the Líanos de Mojos (Plains of Mojos).

Anthropologist C.L. Erickson and a team from the University of Pennsylvania hi.ve discovered that the Llanos de Mojos once supported a Precolumbian complex of societies linked together by networks of communication, trade, and alliances. Erickson asserts that these cultures erected:

> ...thousands of linear" kilometers of artificial earthen causeways and canals,.. .large urban settlements, and intensive farming systems.

Indeed, aerial photographs of this immense región show patterns of canals and causeways that stretch from horizon tr horizon. This is truly a remarkable, virtually unexplored región of ancient human endeavor.

Even the geology of the región stag- gers the imagination. The Llanos de Mojos is a shelf of alluvial deposits 3,000 meters (2 miles) deep!

(Mann, Charles C.j "Earthmovers of the Amazon, Science, 287:786, 2000.)

Comment. The earth-and-water cultures of the Llanos de Mojos should be compared to the "hydraulic civilization" of ancient Sri Lanka. (See Ancient Infra- structure)

A DIRTY STORY FROM AMAZONIA

When, in 1542, the Spaniard Orellana explored the reaches of the Amazon, he reported that the lower third of that great river was marked by large native settlements bristling with unfriendly warriors. When Orellana reached the spot now called Tapajos, so many people rushed down to the river bank that he and his men retreated in fear. Yet, many years later, other explorers saw naught of Orellana's throngs of natives. In fact, the lower Amazon seemed an unlikely place to dig for signs of ancient civili- zations. So, most archeologists ended up admiring the architecture of the Inca in tht high Andes and the Moche along the Pacific Coast.

This situation is changing, though, because those archeologists who cared to look have confirmed Orellana's records. The Tapajos site has yielded evidence that 260,000 to 400,000 people had thrived there a few centuries before the Spanish ships sailed up the Amazon. Tapajos was then about the size of Tenochtitlan, the Aztec capital in México and then the largest city in the world.

Where did all of Tapajos' people go? And how did they and their sister cities along the Amazon and its tributaries make a living before they disappeared?

They left no pyramids, no Stone- henges, no steles carved with symbols to tell us. In fact, their most remarkable creations that have survived the centuries are incredibly fertile plots of black earth called "térra pretas."

The térra pre-tas were much more valuable than stone circles to the early Amazonians because they provided food in abundance. Most jungle soil is very poor. Almost all of the jungle's carbón and soil nutrients is stored above ground in the vegetation. Slash and burn this vegetation into ashes------as is the habit of today's natives------and you can raise crops for only a couple years and then the soil is worn out.

But, beginning about 600 B.C., the ancient Amazonians learned how to make their térra pretas. These rich plots of black earth, when farmed properly, can provide food crops almost indefinitely. They are the key to dense populations in the South American tropics.

Some térra pretas oceupy just a few acres and remain the most valuable farm land in the Amazon Basin. Some of the oíd térra pretas stretch for 7 kilometers and were a kilometer across. Their black soil is only a few feet deep and, strange- ly, chock full of broken pottery—much of it apparently broken intentionally!

How were the térra pretas made? Modern agriculturists do not really know. In fact, they are currently trying vari- ous ways to duplícate them. Perhaps the most important component is charcoal— not ashes. The Amazonians also added animal bones, excrement, and other biological debris. And, as just mentioned, an abundance of potsherds. One terra- preta mound is estimated to contain 40 million potsherds!

The major questions associated with the térra pretas are:

- «Why so many potsherds, which seem to have no agricultural valué?
- ©Why was so much labor-intensive pottery deliberately smashed?
- ©What happened to the great crowds of natives seen by Orellana?
- ©How did the Amazonians control the weeds? This is not a trival concern to today's terra-preta farmers, be- cause the native weeds, given such rich soil, easily out-compete food plants and overrun the plots.

(Mann, Charles C.; "The Real Dirt on Rainforest Fertility," Science, 297:920, 2002.)

Comment. The delibérate smashing of large quantities of pottery seems to have been important all over the ancient world! Why? Part of rituals?

THE MYSTERIOÜS TERRAS PRETAS

Most of the lush jungles of tropical South America grow on a very thin layer of soil that is continuously regenerated by decaying vegetation. Deforest the jungle and the agricultural potential is about that of a your nearest Interstate híghway. But the so-called ''térras pretas" are curious exceptions. Spottcd along Brazil's Aripuana River are small areas of deep, black earth that are from 7 to 17 feet deep. These are the "térras pretas" or "black earths." Scien- tists believe that these fabulously pro- ductive "islands" in the sea of otherwise poor soil were developed by native peoples about 10,000 years ago. No one. knows how these ancient farmers made the térras pretas. The slash-and-burn farming of the present inhabitants is primitive in comparison.

(Anonymous; "Fertile Soil of Ancient Tribes Poses Puzzle," Columbus Dispatch, January 11, 1998. (Cr. J. Fry via COUD-I)

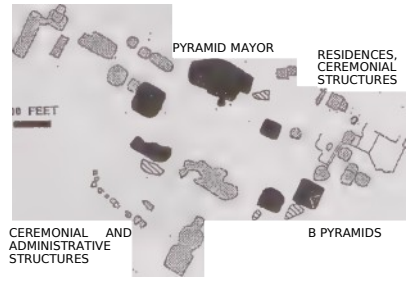
SOUTH AMERICAN MONUMENTAL ARCHITECTURE

THE PATH OF THE PYRAMIDS

About the same time the Egyptians were hauling 100-ton limestone blocks to the Giza Plateau, some South Americans were toting basketball-size rocks in bags woven from reeds to a site called Caral, located 23 kilometers from Peru's Pacific coast. While the Egyptians piled their weighty blocks neatly into pyramids, the South Americans simply dropped their stones, reed bags and all, onto crude but growing piles.

When finished, the largest "rock pile" at Caral contained 7 million cubic feet of rocks and had assumed the shape of a pyramid (or platform mound) four stories high (60 feet) and covering an area 500 by 450 feet. This was probably the first monumental architecture in the New World; and it was constructed some 800 years earlier than mainstream archeologists had expected. In fact, Caral boasts six large platform mounds, three sunken plazas, and many impressive buildings.

For all its precocious architecture, Caral is a "preceramic" site; that is, it was built before the advent of pottery in South America. Caral was "officially" discovered in 1905, but it was neglected by both archeologists and grave robbers because there were no artifaets to eollect and nothing worth stealing. No one re- cognized its great age until just recently. Today, Caral is recognized as the work of the first complex society in the New World.



Arrangement of the structures at the Caral site in Perú.

(Solis, Ruth Shady, et al; "Dating Caral, a Preeeramic Site in the Supe Valley on the Central Coast of Perú," Science, 292:723, 2001. Maugh, Thomas M., II; "Scientists Say Peruvian Ruine Are Old- est City in Americas," Houston Chronicle, April 27, 2001. Cr. D. Phelps. Ritter, Jim; "Pyramids as Oíd as Egypt's," Chicago Sun-Times, April 27, 2001. Cr.
J. Cieciel.)

Comment. Could Caral (built about 2600 BC) have been the progenitor of a wave of pyramid-building cultures that swept northward and manifested itself in the Mayan pyramids (Tikal, circa 700 AD), the Aztec pyramids (Teoti- huacan, 150-750 AD), and the works of the Moundbuilders (Cahokia, 1300 AD)? South-to-north would be just the op- posite direction for a cultural wave originating at the Bering Land Bridge! And there is more to this story. See below.

THB IMPOSSIBLE STONES

An article with the above title appeared in the May 2002 issue of Fortean Times. - The subject is a wall of six massive blocks of red porphyry installed high above a flve-tiered "fortress" composed of huge, Inca-style, interlocked stones at Ollantaytambo, Perú. The Inca fortress is itself a cause for archeological wonder, but the great wall above is even more wondrous. It is about 13 feet high, each of its six blocks weighs about 50 tons.
We see in the wall at least five "problema" which might morph into significant anomalies.

Three of these problema are mentioned by A.F. Alford in his Fortean Times article. [1 2]

(1) Red porphyry is hard igneous rock. How were the 13-foot blocks carved with Buch perfect fíat surfaces and die- straight edges?

(2) How were the 50-ton blocks moved 4 miles from the quarry across a river and then raised to their present position where they amaze the tourists? In 1996, a group of archeologists tried to demónstrate how it was done with a 1-ton block. This relatively puny stone slipped its ropes on the way downhill from the quarry and gravity took it down to the river. The archeologists then managed to drag it across the shallow, cobble-bottomed river. But there they left it, declaring they had now proved how the wall high above could have been made! Their rough, unfinished "pebble" is probably still in the river.

(3) Alford mentions the unique and very un-Inca-like thin sheets of rock separating the six blocks in the wall.
These sheets, which also must have been challenging to the stonemasons, serve no discernible practical purpose.

(Alford, Alan F.; "The Impossible Stones," Fortean Times, p. 50, #158, May 2002)

Comments. We now add two more wall "problems."

(4) One of the porphyry blocks has a T-shaped slot cut into its top for inser- tion of a metal clamp. The same sort of slot-and-clamp construction is seen at pre-Inca Tiáhuanaco built on the shores of Lake Titicaca in B olivia. Given this fact, one wonders if pre-Incans might actually have built the porphyry wall at Ollantaytambo? Whoever built it seems to have left the wall unfinished, seeing there is no block cut to receive the other end of the metal clamp.

(5) Part of the answer may lie in the stream far below the wall, where a 250- ton block resides waiting to be raised up to the wall-----another sign that the wall was riever finished. (A 250-ton stone is big even by Great Pyramid standards! (See our Ancient Structures.)

EQUATOR CORRECTION

Back in 1736, a French astronomical ex-pedition, equipped the best instrumente of the day, set up a stone obelisk near Quito in the Andes to mark the location of the Equator. However with the help of GPS satellites, we now know the French obelisk is 300 meters south of the true Equator:

> ...where a low semicircular wall dating from the tenth century stands. This wall precisely follows the are of the sun's shadow as the earth tilts between the winter and summer sol- stices, 22 December to 21 June. So how did the builders of this wall calcúlate the position of the Equator without the benefit of modern satellites?

(Anonymous; "Early Astronomers," Crea-tion, 25:8, no. 1, December 2002-Febru- ary 2002. Cited source: Geographical, p. 36, September 2002.)

EUROPE

We could not completely ignore Stonehenge, but we do have some material on woodhenges and, more surprisingly, European pyramids! Also of more than passing interest is the Neolithic knowledge and use of acoustics.

- **Henges of Stone and Wood.**
- **Unexpected Pyramids in Europe. Germany, Greece, Canary Islands.**
- **Neolithic Structures and the Use of Sound.**
- **Miscellaneous European Structures. Pit zodiacs and (?) a possible Neanderthal structure.**

Ollantaytambo[1] s wall of six giant stones. Note the unusual thin stone sheets separating the Zarpe stones. Their purpose is elusive. (C. Casale)

HENGES OF STONE AND WOOD

STONEHENGE IN THE 1990s: A MAINSTREAM VIEW

In a recent number of Nature, C. Rue- gles reviewed the present status of Stonehenge as inainstream archeologists now see this world-famous monument.

- The construction of Stonehenge be- gan a bit earlier than previously thought: 2950 ± 50 BC. But beneath the present parking area are post holes dated 4,000 years earlier! They are apparently not related to the Stonehenge we know.

- The idea that Stonehenge[1] s blue-stones, which originated in the Preseli Mountains of Southwest Wales, 200 kilo-meterB distant, were carried to Salís-

bury Plain by glaciers has been emphatically disproved by geologists. These 4-ton stones were transported by people! This great effort required precocious social organization, eommunication, and some kind of psychological Ímpetus.

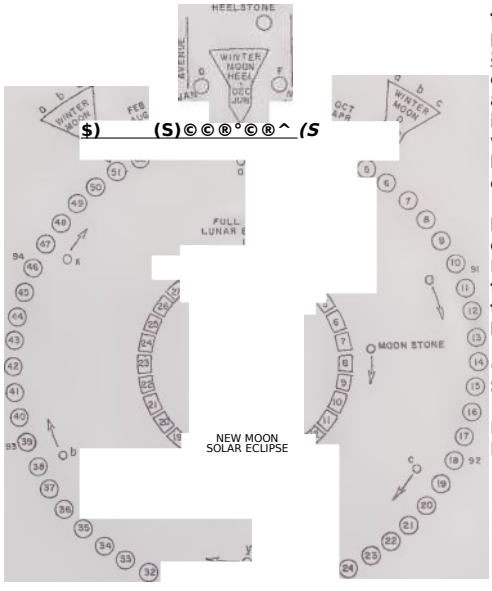
•The sarsens-----those even bigger stones that define Stonehenge in our mind's view----evoke the same sorts of questions as this issue's eccentric flints: Why? and How? Ruggles writes:

> Why it was important to bring stones from so far away is an open question, as is the issue of how people achieved the almost unimaginable feat of haul- ing the sarsens, weighing 25 tonnes or more, over 30 km from the Marl- borough Downs in the north.

•New studies of the other ancient monuments in the vicinity of Stonehenge have revealed that they were not placed at random. Many are visible from Stonehenge. Stonehenge is at the center of a number of "nested bowls.[11] [?] Further, barrows of the Early Bronze Age were placed in lines along the horizon ridges visible from Stonehenge. There was ob-
vious regional planning-----a máster plan that we have not yet deciphered.

elt is now generally accepted that astronomical alignments do exist at Stonehenge, and that the monument itself and the surrounding sites are somehow^ related to astronomical túne- eycles. How- ever, mainstream opinión has not been kind to the 1960's visión of Stonehenge as a Neolithic Computer and/or astronom- ícal observatory. This idea is now seen
as: "... an artefact of its times--------one of the most notorious examples known to archaeologists of an age recreating the past in its own image."

(Ruggles, Clive; "Stonehenge for the 1990s," Nature, 381:278, 1996)



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In the 1960s, some scientists saw Stonehenge as an astronomical Computer of sorts, as in this conceptualization by G. S. Hawkins. This idea is still

Comment. If Stonehenge is not a 1960's cyber-visión, just what did the Stonehengers have in mind? Did the even- more-ancient people who dug those post holes now under a parking lot feel a similar psychological impulse?

OÜT-HENGING STONEHENGE

Stonehenge may be more sophisticated in terms of astronomical alignments, but it is dwarfed by the newly discovered henge surrounding Ireland's hill of Tara. (A "henge" is simply a circular ditch and embankment.) The henge's ditch at Tara is 3 meters wide with a curious series of pits on either side. Its diameter is about 1 kilometer (5/8 mile) compared to Stone- henge's diminutive 100 meters.' Tara had long been considered an Iron Age site, but the presence of the giant henge pushes its use as a ceremonial site back to Neolithic times say, to 2,500 B.C.

(Anonymous; NEARA Transit, 11:14, Spring equinox 1999.)

Question. Are those pits analogous to the mysterious Aubrey holes at Stonehenge?

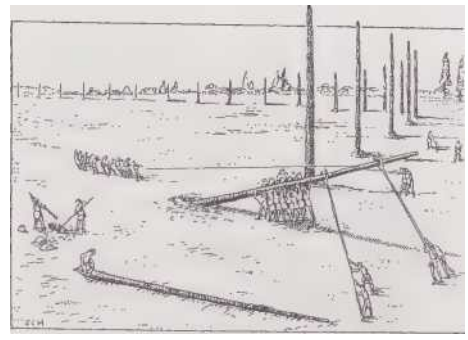
WOODHENGES BEFORE PYRAMIDS

The ancient inhabitants of Britain were constructing massive structures before Cheops, builder of the Great Pyramid, was even born! One of these structures is 5,000 years oíd. It is located at Stan- ton Drew, in southwestern England. But tourists at the site see only the Great Circle of standing stones, which is im- pressive enough but only the tip of the iceberg, so to speak. What is more spec- tacular is "seen" only by sensitive mag- netometers. These instruments deteet faint, ghostly remains of the magneto- tactic bacteria that consumed the giant oak pillars that graced this site five millennia ago.

The soil inside the Great Circle reveáis that there were once 400-500 oak pillars on the site. These massive cylin- ders were probably a meter in diameter, 8 meters (26 feet) high, and weighed 5 tons each. The rings of pillars occupied an area about the size of a football field (100 meters in diameter). The Stanton Drew woodhenge was probably too large to have been roofed, but the oak co- lumns might have been carved or deco- rated.

Why would anyone cut, haul, and array hundreds of massive oak pillars in nine concentric circles? Obviously, the ancient Britons used this oaken temple to seek help from supernatural powers! Well, that's what the archeo- logists say, but who really knows?

(Hawkes, Nigel; "Woodhenge Find Rivals Stone Circles," London Times, November 11, 1997. Cr. A.C.A. Silk. Also: Ave- ling, Elizabeth; "Magnetic Trace of a Giant Henge," Nature, 390:232, 1997.)



Contrary to the London Times article, woodhenges are not unique to Britain. Above is an artist's conception of the construction of the woodhenge at Cahokia, Illinois.

UNEXPECTED PYRAMIDS IN EUROPE

Normally, one does not associate large, ancient pyramids with the continent of Europe. Yet, pyramids of sorts can be observed in Greeee and the Canary Is- lands. There are even suggestions of a Celt-built pyramid in Germany.

THOSE ANCIENT GREEK PYRAMIDS

That's right. Greek pyramids! On Greek soil, at Hellenikon and Ligourio west of Athens in the Argolid región, are two limestone pyramids that are stylistically very much like those at Giza near Cairo. The big difference is size; the Greek pyramids are only the size of a large room compared to the Great Pyramid's height (with capstone) of almost 500 feet.

When exeavations were made around the Greek pyramids in the early 1900s, pottery fragments from the Fourth Century B.C. were found, and it was pre- sumed that the pyramids were also con- strueted then; that is, about the time of Alexander the Great. Recent dating of crystals from internal surfaces of the limestone bloeks using thermolumine- scence puts the construction times back two millennia. The Hellenikon pyramid dates to 2730 B.C.; the Ligourio, to 2260 B.C. This means that the Greek pyramids were built in roughly the same time frame as the Egyptian pyramids.

Why would the ancient Greeks want to build miniature pyramids? The classi- cal acholar Pausanias wrote in the Second Century A.D. that the Hellenikon pyramid was a cenotaph for the dead fallen in a fratricidal battle 4,000 years ago. Nobody believed his story until now.

(Hammond, Norman; "Did the Early Greeks Simply Copy the Pyramids of Egypt?" London Times, August 1, 1997. Cr. A.C.A. Silk. Also: Barnett, Adrián; "Written in Stone," New Scientist, p. 11, October 4, 1997.)

THE BLACK PYRAMIDS

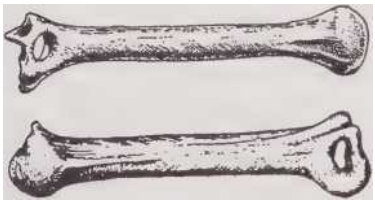
Spain's Canary Islands off the northwest coast of Africa hardly seem a place for pyramids, buí there seem to be six of them on Tenerife, near Guimar. The in- habitants of this island have generally ignored these dilapidated piles of black volcanic stones. However, one perceptive native described them in a letter to T. Heyerdahl of Kon Tiki fame and a leading proponent of ancient cultural diffusion across all oceans.

Quick to respond, Heyerdahl per- ceived amid the debris six stepped pyramids of black stone. He persuaded a Norwegian businessman to buy the site, clean up the debris of centuries, and found a museum. One of the "black" pyramids has now been restored, but some experts are still unconvinced. However, recent excavations under one pyra- mid have yielded artifacts identifled with the pre-Spanish inhabitants of Tenerife. Meanwhile, Heyerdahl has been checking out a rumored pyramid on Sicily.

Could Heyerdahl be right when he claims there were age-old cultural links between Mesopotamia, Egypt, México, the Canaries, and even the Pacific Islands? _

(Mead, Robin; "Riddle of the Black Pyramids," London Times, December 19, 1998. Cr. A.C.A. Silk)

Comment. The pre-Spanish inhabitants of the Canaries were the Guanches, who are noted for two other interesting things: (1) A very high frequency of the olecranon perforation of the upper arm bone¡ and (2) The use of a lan- guage of whistles, which they use to communicate over long distances.



The olecranon perforation of the humerus is unusually frequent among the Guanches, the pre-Spanish inhabitants of the Canary Islands. Were they the builders of the Black Pyramids?

A LARGE CELTIC PYRAMID IN GERMANY?

We usually think of Germany as a land of oíd castles rather than ancient pyramids. Yet, W.-J. Langbien senda this English summary of an article that has appeared in a Germán magazine:

> **Magazin fur Grenzwissenshaften has received information about a Celtio monument from an amateur archeologist. Walter Haug contacted us and described this prehistoric structure. He had attempted to bring about an investigation by Germán federal agencies. However, this was refused. The professional archeologists are of the opinión that they are dealing with a quarry. MG investigated the matter. We visited this alleged early quarry and discovered a few things! We thought it odd that that it's been classified as a Román or Celtic quarry.**
>
> **The site itself is located in the Sternenfels district about 25 km west of Pfortzheim/Baden-Wurttemberg.**
>
> **The structure consiste of:**
>
> 1. **An almost central dome-hill laid in briek, surrounded by natural, hewn stones.**
>
> 2. **The dome-hill (height: Í5-18 m; length: 100 m; width: 60-80 m) was stacked blockwise with Keuper sandstones and clay slate.**
>
> 3. **The structure's volume is estimated at about 60,000 cubic meters, which corresponde to about 100,000 tons of rock.**
>
> 4. **The encompassing artificial rock walls are thought to have served as a quarry for the manufacture of the dome stratification.**
>
> 5. **These rock walls were hewn artificially with tools after the quarrying of the dome stones... a place of wor- ship?**
>
> 6. **According to the map, this dome structure forms a connecting axis with other Celtic sites in this area.**

Summarizing additional data from the translation: (1) This is the largest pyra- raid in Europe; (2) The surrounding rock walls show tool marks, several petroglyphs, and Celtic symbols; and (3) It is suspected that this site might have been used for ritual purposes.

(Anonymous; Magazin fur Grenzwissenschaften, no. 5, 1993. Cr. W.-J. Lang- bein)

Comment. We have seen no references to this structure in the English- language archeological literature— not even in fringe publications.

NEOLITH1C STRUCTURES AND THE USE OF SOUND

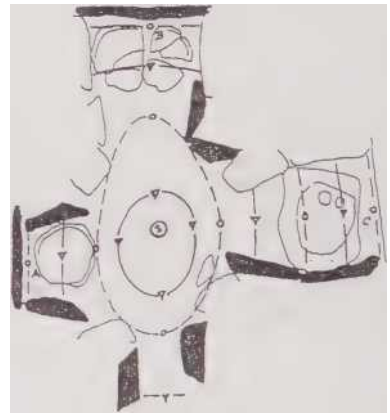
ANCIENT ACODSTICAL ENGINEERING

In vol 1, p. 43, we reviewed R. WaUer's aeoustical measurements at ancient rock-art sites in Europe, North America, and Australia. Waller claimed that some rock art was intentionally placed where echos from the walls are not only exceptionally loud but are also qualitatively related to the art's subject matter, such as running hoofed animáis.

In a similar venture, R.G. Jahn et al have taken sound generators and meters into the chambers of six ancient structures and measured their aeoustical properties. The sites selected were: Wayland's Smithy, Chun Quoit, and Cairn Euny, all in the U.K.; Newgrange, and Cairns L and I, Carbane West, all in Ireland. All of these sites date back to about 3,500 BC. The chambers were all bounded by roughly hewn stones, but they had very different configurations. Newgrange was cruciform (see sketch); others were rectangular, beehive, and petal-shaped. Quoting the abstract from the Princeton report, here is what the aeoustical surveys found:

> **Rudimentary aeoustical measurements performed inside six diverse Neo- lithic and Iron Age structures re- vealed that each sustained a strong resonanee at a frequency between 95 and 120 Hz (wavelength ~ 3m). Despite major differences in chamber shapes and sizes, the resonant modal patterns aH featured strong antinodes at the outer waHs, with appropriately configured nodes and antinodes inter- spersed toward the central source.**
> **In some cases, internal and exterior rock drawings resembled these acoustical patterns. Since the resonant frequencies are weH within the adult male voice range, one may speculate that some forms of human chanting, enhanced by the cavity resonanee, were invoked for ritual purpose.**

In a few cases, it appeared that some of the standing stones had beeen intentionaUy positioned to enhance the chamber's aeoustical properties.



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The New Grange chamber in Ireland showing aeoustical nodes and antinodes. Antinodes occur at the chamber's stone walls.

(Jahn, Robert G., et al; "Aeoustical Resonances of Assorted Ancient Structures," Technical Report PEAR 95002, Princeton University, March 1995. Devereux, Paul, et al; "Aeoustical Properties of Ancient Ceremonial Sites," Journal of Scientific Exploration, 9:438, 1995.)

Comment. Apparently, humans living over 5,000 years ago were rather so- phisticated in their ability to manipúlate sound to impress audiences. This talent has not been lost; for example, rock music!

ANCIENT STAGE DESIGN

In two issues of Scientific Frontiers, we have reported on the acoustical pro- pertiqs of rock-art sites (pp. 14 and 40) and megalithic chambers (above). This ancient recognition and use of the pro- perties of sound to impress gatherings of people is rather remarkable for 4,000-5000 years ago. But we must be even more appreciative of megalithic-age tálente when we discover that they also wedded visual effeets with acoustical engineering when staging rituals and ceremonies. In effect, they were pio- neering the design of auditoriuras and ohurch interiors.

This marriage of architecture and sound was studied at two megalithic sites by A. Watson and D. Keating. Since we have previously attended to the acoustics of stone chambers, we will bypass their work on the huge chambered caira called Camster Round and focus on the recumbent stone circle (RSC) called Easter Aquorthies near Aberdeen, Scotland.

That RSCs are not ordinary stone eircles is seen in this quotation from the paper by Watson and Keating.

> Recumbent stone circles possess a number of charaeteristic features that have primarily been interpreted in visual or aesthetic terms. For example, their standing stones tend to be graded in height towards thé Southwest, creatmg a visual focus for the the large recumbent block itself, which lies between the two tallest stones. The recumbent at Easter Aquorthies is elaborated by two stones which project from its inntr face to form an aleove. The stones in the circle also appear to have been chosen for their colour.

9 >

Easter Aquorthies is a recumbent Neo- líthic stone circle, with two sound- focussing stones projecting inwardly. Circle diameter: about 19 meters.

Casual observers at Easter Aquorthies had often remarked on curious echoes and reverberations heard inside the ring of stones. It seemed that the recumbent stone with its flankers and projecting stones were focussing sounds towards occupants of the ring.

Watson and Keating decided to sur- vey the circle and its surroundings acoustically, using an audio amplifier placed in the aleove. Measurements con- fírmed the focussing the sounds within the ring but did not record the subtle reverberations detected by humans. Sounds from the amplifier were almost totally confined to the ring. It seems that Easter Aquorthies was designed deliberately to enhance the acoustical and visual effeets experienced by an audience within the ring.

(Watson, Aaron, and Keating, David; "Architecture and Sound: An Acoustic Analysis of Megalithic Monuments in Prehistoria Britain," Antiquitv, 73:325. 1999.)

a £ı

Comments. There are about 70 recumbent stone circles in Britain, mostly in northeastern Scotland. They are char- acterized by the single recumbent stone, which almost invariably appears in the southwestern part of the ring.
No obvious astronomical phenomena, such as winter-solstice sunsets, can be seen over the prostrate stone, so its placement is an enigma. In addition to this mysterious recumbent stone, almost all RSCs have either 10 or 11 accompanying standing stones. These two numbers may have had some mysti- eal significance. The recumbent stone suggests an altar, perhaps a sacrificial one. In this regard, the bones of many young children have been excavated at the RSCs!
For more on the mysterious RSCs, see our catalog Ancient Infra- structure.

MISCELLANEOUS EUROPEAN STRUCTURES

REINVENTING THE NEANDERTALS

The public image of the Neandertal is that of a brutish, hardly human creature ciad in a ragged skin and unable to speak save for a few grunts. Forget that picture. Several hundred meters deep inside a cavern near Bruniquel, in Southern France, spelunkers stumbled across a complex quadrilateral structure, 4x5 meters in extent, built up from chunks of stalactites and stalagmites. Within its "walls" they found a piece of burnt bear bone that was later carbon- dated as at least 47,600 years oíd. A burnt bone and a geometrical structure certainly suggest the work of an intelli- gent creature, as does the site's great distance from the surface. Torches would have been a necessity that far in. That 47,600-year figure, though, presenta a problem. The first Cro-Magnons didn't filter into western Europe until about 35,000 BP. According to the ac- cepted ahthropologieal schedule, only those subhuman Neandertals inhabited that part of France in 47,600 BP. So, we must conclude that the Neandertals knew well the sophisticated use of fire. They also had enough curiosity to ven- ture deep into the earth, where for some unknown purpose they piled to- gether an enigmatic structure. All this also seems to require more information transfer than possible with a few "ughs"!

(Balter, Michael; "Cave Structure Boosts Neandertal Image," Science, 271:449, 1996)

How the Neandertal was pictured in ■ an 1873 issue of Harper's Weekly. No sensitiva, caring, loquacious man he!

There is always the possibility that those mysterious Cro-Magnons, who seem to have appeared out of nowhere, got to western Europe ahead of schedule. They are probably the artists who made those 31,000-year-old cave paintings at Grotte Chauvet in Southern France.
Even though of slighter build and smal- ler brains, the Cro-Magnons are thought to have quickly replaced the Neandertals.

Complicating the picture is abundant fossil evidence of so-called "archaic" Homo sapiens in Europe commencing some 500,000 years ago. Did these archaic versions of modera humans evolve into Neandertals before the Cro-Magnons (modera humans) arrived on the scene? Some paleoanthropologists now believe so. Just the other day it was generally thought that Homo erectus rather than "archaic" Homo sapiens gave rise to the Neandertals.

(Hublin, Jean-Jacques; "The First Euro- peans," Archaeology, 49:36, January/ February 1996)

Comment. We, too, are confused. Don't take these human evolutionary family trees too seriously. They change with each new "find," and these seem to come several times each year.

THE PIT-ZODIACS

Schagen-Muggenburg lies 50 kilometers north of Amsterdam. The Muggenburg part of the town ñame is only a few years oíd. Before it was built, archeolo- gists were allowed to explore the mea- dows making up the construction site.
L. Therkorn, an archeologist from the University of Amsterdam, led the ex- ploration team. The digs yielded arti- faets going as far back as 300 AD, when this región was sparsely populated by farmers. However, if Therkorn et al had dug up only these oíd bones and pottery shards, we would not be writing this for Science Frontiers!

For anomalists, it was the pits----- oíd pits that had been filled in and that seemed to be arranged in an intricate pattern that mirrored the star constel- lations making up the classical Greek zodiac. But this revelation didn't come until later. After all, pits are common

in archeology. Often they contaln just rubbish, sometimes human remains.

> But the pits at Muggenburg are difieren!:. There are 57 of them, eaeh about a meter wide and deep, extend- ing over about half a hectare [about li acres] They were certainly not used for storage because the level of the groundwater is too high. Ñor were they used as dumps; archaeo- logical evidence shows that they were filled in shortly after they were dug, and some have very little in them.

It was only when Therkorn mapped the pits did she see that they were not distributed at random. Connecting them as children do with dot-puzzles, she quickly recognized the constellations Taurus (bull), Canis Major (dog), Pega- sus (winged horse), and Hercules. The pits were geoglyphs of a new sort, stre- ching for more than 100 meters, sort of Nazca lines in Holland. About 500 meters from the 57-pit array, still another Taurus pattern of pits was un- covered.

The mysterious pits didn't contain much, but there were often a few animal bones. The Taurus pits yielded eat-_ tle bones; the Pegasus pits, horse bones; etc.; with the bones matching the zodiac animal in each sign. Therkorn surmised that the animal remains repre- sented ritual sacrifices that were proba- bly time-coordinated with specific celestial positions of the real stellar constellations .

The pit-zodiac story does not end at Muggenburg. At Velserbroek, over 40 kilometers distant, Taurus and Pegasus pit-patterns have been identified.- These are dated at 600 BC-----1,000 years ear- lier than Muggenburg.

The pit-zodiacs show astronomical sophistication unexpected in European farmers 2,600 years ago. And how did these "barbarians" learn about the zodiac of the "civilized" Greeks and Baby- lonians long before the Román legions pushed north into Gaul? Of course, the mainstream archeologists will have none of this.

(Schilling, Govert; "Stars Fell on Mug- genburg," New Scientist, p. 33, Decem- ber 16, 1995)

Comment. Across the Channel in Britain, one also finds the equally controversial Glastonbury Zodiac, another purported large-scale representation of the zodiac.

AN IRON-AGE SPREAD

Back in the 1950s, aerial photoB of North Yorkshire, in Britain, revealed mysterious lines extending for about 10 kilometers on the terrain below. More recent aerial survey work plus ground excava- tions tell a Wild West story!

> They identified ditches and banks which created funnels used to channel thousands of livestock into droveways. It's thought the funnels were part of a much bigger system stretching over 20 km. Team leader Dave MacLeod said: "Essentially we are looking at the remains of a highly sophisticated business that is more reminiscent of the High Chaparral than small scale peasant farming. It paints a vastly different pieture of the Iron Age."

(Anonymous; "Iron Age Dude Ranch," World Explorer, 3:9, no. 3, 2002. Source cited: BBC, October 25, 2002.)

Comment. See our Ancient Structures for evidence of giant Neolithic cooking hearths in Britain. One pictures in one's mind massive ancient barbeques. But did they have good chili?

MIDDLE EAST

THE H1DDEN "GARDENS"

Some of the world's strangest "gardens[1] appear as green dots on the shimmering deserts of the island of Bahrain in the Persian Gulf. These green dots are not your usual oases. Rather, they are springs that once fed long chain-weH systems that carried water to vülages at their lower ends. CaUed "qanats," these multimile subterranean structures were invented about 750 B.C. for trans- porting water efficiently in the dry desert climes of the Middle East.

In our catalog Ancient Infrastructure, we describe the qanats of Irán. (See diagram.) Some of these shaft-tunnel structures run for miles and represent a prodigious amount of labor. How pro- digious? In Irán alone there are about 37,500 qanats with an aggregate length of some 100,000 miles! Qanats rank right up there with the Inca roads and the Great WaU of China as wonders of the ancient world.

After reading the catalog section on Iranian qanats, E. von Fange informs us that the qanats of Bahrain pose a set of different problems. The Bahrainian qanats are easy to follow across the desert because the access shafts pro- trude a few feet above the sand. As one foUows them up-Blope for a mile or two, some greenery appears in the distance — low bushes perhaps. A closer approach proves instead that the greenery is actually the tops of palma. These trees are growing in a sunken oval area about 200 yards long girt by a wall 20-30 feet high. Outside, the desert sand reaches nearly to the top of the wall; inside, steps lead down to limestone bedrock from which springs of crystal-clear water flow. The qanat entrance can be seen down near the bottom of the waH, but the water level is now too low to feed the abandonad qanat.

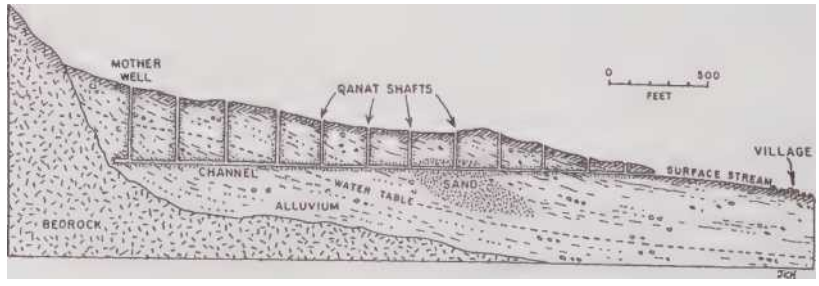
In his book Looking for Dilmun, G. Bibby asks some pertinent questions.

> Has twenty feet of sand been dug away by hand over the enormous area needed to expose a matter of fifteen thousand square yards of bedrock and the springs that broke forth there? And was a twenty-foot waH then built and the sand piled back around it? And if so how had they known where to dig and find the springs? For if not there was only one other explanation. That we were standing there on the original ground surface. That once upon a time the whole hill slope had been naked rock at the level at which we stood, with springs in the hoUows, and that the irrigation channels, probably indeed roofed from the start to prevent evaporation, had been dug at ground level or only a little below. In that case- the sand carne later, and the waH around the springs, together with the "chimneys" giving access to the qanats, had been built up gradu- aHy, to keep pace with the encroach- ing sand. This would suggest that the sand was comparatively recent, how recent only an investigation into the age of the qanats could determine.

(Bibby, Geoffrey; "The Hidden Gardens," in Looking for Dilmun, New York, 1969, p, 45. Cr. E von Fange)

Comment. We wonder why sand has not blown over the wall into the "hidden garden."

Ancient qanats are found in many arid areas around the Middle East and, very interestingly, in Peru's Nazca Valley, where they are caUed "puquios."



Cross section of a typical Iranian qanat. ünlike the exposed springs of the Báhranian qanat described above, the water supply here is at the bottom of a deep well. (From: Ancient Infrastructure)

THE "RITES" OR "KEYHOLE" STRUCTURES OF THE MIDDLE EAST

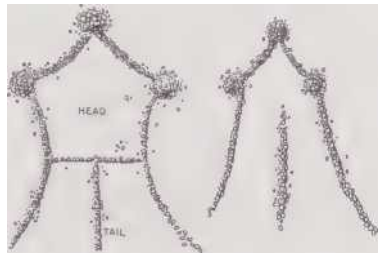
Thousands of walled structures decórate **the deserts and plains of the Middle East. Most are V-shaped terminating in** a cul de sac studded with large rock piles. (See illustration.) Most of the wall arms are 300-3,000 meters long.
They are construeted of basalt rocks fror ancient lava flows. Artifacts found nearby suggest ages of at least 7,000 years. Younger, but very similar, structures have been found in Central A sia.

A. Betts of the University of Sydney has been exploring these walls and at- íempting to discern their purpose. The best explanation seems to be that the ancient inhabitants of the región drove herds of wild animáis into the wide mouths of the kites and then slaughtered them when they were trapped at the corral-like ends. The worst explanation ís that extraterrestrials built them for some unknown purpose!

(Anderson, Ian; "Prehistoric Prey Met Death through a Keyhole," New Seientist, p. 15, September 24, 1994.)

Comment. Some kite walls extend 30 kilometers (18 miles) and represent a considerable investment of labor. See aiso: Field, Henry; "Early Man in North Arabia," Natural History, 29:32, 1929.

Native Amencans built "game-drive fcnces" using rocks and boulders. The object was to drive buffalo herds over precipices to their deaths. See Ancient **Infrastructure**



Typical Arabian "kites" or "keyhole" structures.

from the rough-hewn, locally quarried limestone to the highly polished tura limestone often found in the entryways
of tomb chambers.

At the end of the polished section was what appears to be a door, made of the same tura limestone and with tongue-and-groove fittings on the side that suggest it can be raised and lowered. It has two corroded copper fittings in the center; a piece of one fitting had broken off and was found lying in front of the stone. A small gap exists at the bottom of the stone, but the camera could not peer through it.

But what could lie beyond this tiny door deep in a shaft too small for hu-mans? Is there a hidden chamber? Might it contato the body of Khufu, builder of the Great Pyramid, whose rematas have never been found? A suspicious layer of black dust outside the door suggests the past presence of orgaxdc matter.

Egyptologists find the whole business "very annoying." Germán archeologist R. Stadelman stated, "There is surely no other chamber."

Meanwhile, Gantenbrink plans to slip a fiber-optic camera through the crack under the "door" to resolve the matter.

(Maugh, Thomas H., II; "A Robot's Mysterious Discovery," San Francisco Chroniele, May 2, 1993. Cr. J. Covey. Also found to the Wellington, New Zea- land, Evening Post. May 1, 1993. Cr. P. Hassall.)

AFRICA

Truly astounding new discoveries have been made within the Great Pyramid-----even after 4,500± years. We also take a look at all those "other" pyramids in the Sudan. Also, there are other impressive structures in Africa outside of Egypt and the Sudan.

«The Great Pyramid: New Discoveries. The air-shafts, of course.

«The Neqlected Pyramids of the Sudan.

•Remarkable Ancient Roads and Walls in Africa.

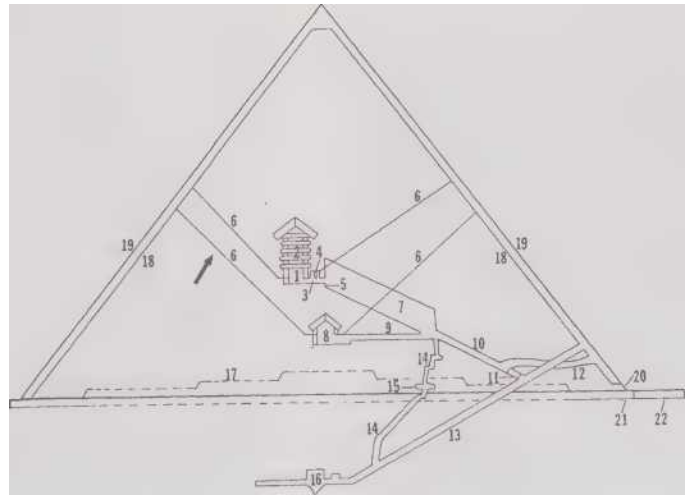
FROM DOOR TO DOOR TO WHAT OR------- PERHAPS----TO WHOM?

Above, we described the discovery to one of the "airshafts" originating to the Queen's Chamber of the Great Pyramid of an apparent limestone door or plug. This door was equipped with what seemed to be copper handles. A small pile of black dust lay to one comer by the obstructtag door. It suggested that something organic

THE GREAT PYRAMID: NEW DISCOVERIES

A ROBOT'S MYSTERIOUS DISCOVERY

A Germán roboticist, R. Gantenbrink, was hired to olean out the debris clog- ging the 8-inch-sauare "ventilation" shafts to the King's Chamber of the Great Pyramid at Giza. Remotely con- trolling a robot resembling a miniature tank, Gantenbrink subsequently explored tb cleared shafts. Ftading nothing wirth noting there, he requested per- mission to send the robot crawling up a similar shaft in the Queen's Chamber below. Early archeologists had already plumbed this shaft with long pipes and had concluded that it ended after about 9 feet. Gantenbrink's robot, using its camera eye, found that this shaft did noi end where expected but instead veered upward at a 45° angle. Climbing the incline, the robot found that the t exture of the limestone walls changed



A cross section of the Great Pyramid looking west. The King's Chamber is #1; the Queen's Chamber, #8. The "ventilation" shafts are numbered #6. The arrow marks the newly discovered "door." (Adapted from: W.R. Fix's Pyramid Odyssey, 1978)

might exist beyond the door. An enigma? Sure! But the mystery of the pyramid's air shaft and this particular door is only part of the story.

To put it all in perspective, the King's Chamber in the Great Pyramid is situated just above the Queen's Chamber.
It has two obvious shafts that lead all the way to the pyramid's exterior. We can, therefore, with reason, cali them "air shafts." Of course, these shafts might have also had mystical/astronómica! significance as well.

But when the Queen's Chamber was first entered by archeologists, no air shafts were in evidenee. However, W.
Dixon, an engineer, had a hunch (based, we expect, on the shafts in the King's Chamber) that the Queen's Chamber also had air shafts but that they were con- cealed.

In 1872, Dixon noticed a crack in the south wall of the chamber and began exploring with a chisel. After removing about 5 inches of limestone, his hunch proved correct. A shaft measuring 8 by 9 inches appeared. It had been hidden for 4,500 years by a stone block with a "blind" hole; that is, it was only partly pierced by the shaft. A corresponding shaft was quickly found in the north _ wall.

The Southern shaft runs horizon- tally for 7 feet and then angles sharply upward, Neither shaft of the Queen's Chamber reaches the pyramid surface— so much for the "air-shaft" theory.

It is hard to imagine the purpose of the two concealed shafts. But some sci- entists decided to try to ftad out. In 1993, R, Gantenbrink remotely guided a small robot vehicle named Upnaut up the Southern shaft. The first surprise was a sudden change in construction material from the common pyramid limestone to finely polished Tura limstone usually reserved for sacred areas. Finally, after crawling 217 feet, Upnaut carne to the famous door. The robot could go no farther. A more sophisticated machine was needed.

The next machine, dubbed "Pyramid Rover," was built to look beyond the door. In 2002, the $250,000 robot follow- ed Upnaut's trail up the inclined shaft to the door. The Pyramid Rover then drilled a hole through the 3-inch lime- stone door and slipped a tiny camera and light source through it.

The pictures it sent back down the cable to the waiting scientists only deepened the mystery. Beyond the door was still another door or plug! Whatever lies beyond the second door must have had immense significance to the builders of the Great Pyramid that they would secrete it in a long, concealed shaft and barricade it behind at least two doors.

(Anonymous; "In Much-Hyped Great Pyra- mid Show, Door Reveáis.. .Another Door," Austin American-Statesman, September 17, 2002. Cr. D. Phelps.)

Comments. Is there a chamber beyond the doors, containing, perhaps, the rematas of Khufu, the supposed builder of the pyramid? His bones have never been found.

The Queen's Chamber is not without other enigmas. Its walls are beautifully finished but its floor is incongruously rough. In its east wall is carved a niche 3 feet, 5 taches deep, vacant and strange of pattern. The chamber walls were covered with a i-inch layer of a "salt," consisting of ordinary salt, calcium carbonate, and gypsum. This layer may be an exúdate from the lime stone. lf so, why are similar salt layers not found on all the pyramid limestone? (See our Ancient Structures for many more pyramid anomalies.

PYRAMID STONES NOT "CEMENTITIOUS"

On p. 28, we followed the Ítem on artificial basalt with a comment about J. Davidovits' claim that the stone blocks of the Giza pyramids are actually made from a limey cement and poured on-site. No long-distance hauling and lifting tato place required! We have since found (serendipitously) an authoritative re- futation of Davidovits' claim.

K.D. Ingram et al analyzed stone sam- ples from the Giza pyramids using scan- ning electrón microscopy, electrón dif- fraction by X-rays, powder X-ray dif- fraetion, inductive coupled plasmography, Fourier-transform infrared spectroscopy, and other techniques. Their conclusión:

> ...the pyramids are made of lime- stone and are not cementitious in nature.

(Ingram, Kevin D., et al; "The Pyramids — Cement or Stone?" Journal of Archaeo- logical Science, 20:681, 1993.)

Comment. Davidovits' claim is presented [*150] in more detail in Ancient Structures.

A "MAGIC NUMBER"ENCODED IN THREE OF THE WORLD'S MAJOR PYRAMIDS

In the August 21, 2003, issue of Nature, J. Diamond, a promtaent American seien- tist, wrote an article describing the propaganda roles he believes were played by the massive pyramids in Africa, Meso- america, and South America. In a paren- thetical aside, he asked:

> Is there any reason why the largest pyramids of Egypt, México, and Perú all arrived at the same magic number for their base areas?

This magic number is 5 hectares (just over 12 acres). The subject pyramids were built at different times by different cultures using different materials. So, the triple cotacidence makes even main- stream archeologists wonder.

The three pyramids are:

The Great Pyramid. (Egypt, 2500 B.C., 146 meters high, limestone blocks)

Pyramid of the Sun. (México, about 150 B.C., 63 meters high, earth faced with stones and mortar)

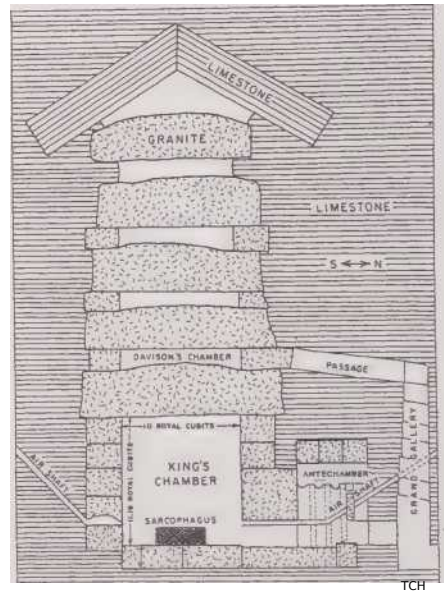
Huaca de Sol. (Perú, about 100 A.D., about 29 meters high, sun-dried adobe bricks)

(Diamond, Jared; "Propaganda of the Pyramids," Nature, 424:891, 2003)

Comments. The above figures are approx- imate. They have been corrected for erosión and reconstruction. But, general- ly speaking the cotacidence is striking.

GRANITE-WORKING IN ANCIENT EGYPT

The ancient Egyptians cut and shaped limestone with ease and alacrity. The 2.5 militan multiton limestone blocks in the Great Pyramid are more than ampie proof of their ability to work this soft stone. But how about the polished blaek- granite walls of the King's Chamber in the Great Pyramid and the hollowed-out sareophagus of obdurate chocolate- . colored granite in the same room? These granites are much harder than limestone and even harder than the copper saws and drills that the Egyptian stone- workers had at their disposal. So, how did they work their granite? [No lasers allowed!]



TCH

The King's Chamber in the Great Pyramid is encased in multiton blocks of hard-to-work polished granite. For some unknown reason, the five granite ceiling slabs were finished only on their bottom sides. (From: Ancient Structures)

As a matter of fact, there is little mystery here despite what you read in the popular magazines. The Egyptian workers simply dribbled quartz sand beneath the copper saws and drills. This abrasive is harder than the mica and feldspar componente of granite but not the quartz. Nevertheless, granite will yield slowly to the abrasive, as do the copper tools themselves.

In 1999, D.A. Stocks teBted the effi- cacy of copper saws and driHs on the granite ta the Aswan quarries 500 miles up the Nile. The copper saw in his test was 1.8 meters long, 15 centimeters in depth, and 6 millimeters thick. Stocks experimented with both wet and dry sand and smooth and notched saws. In one test, workmen cut a slot 3 centimeters deep and 95 centimeters long in 14 hours. It was slow work, but the ancient Egyptians had plenty of time and manpower. In the same experiment, the copper saw blade was ground down 7.5 millimeters. Overall, dry Band with a smooth blade worked best.

Similar tests with a tubular copper arul were also suc ceas ful.

(Stocks, Denys A.; "Testing Ancient Egyptian Granite-Working Methods in Aswan, Upper Egypt," Antiquitv, 75:89. 2001.) —*-

Comment. Stocks dld not confront a potential stone-worktng anomaly identified by C. Dunn in his The Giza Pyramid.
It seems to Dunn that the drill marks on the sides of the sarcophagus in the King's Chamber ímply that the soft cop- per Egyptian drills apparently advanced about 500 times faster than possible with the toughest modern drills! There is something amiss here.

THE NEGLECTED PYRAMIDS IN THE SUDAN

THERE ARE MORE PYRAMIDS IN SUDAN THAN ALL OF EGYPT!

The kingdom of Cush (or Kuslr) flour- ished south of Egypt along the Nile from the Eighth Century B.C. to the Fourth Century A.D. Here the rulers of Cush built some 228 pyramids, three times as many as the Pharaohs managed to pile up! We rarely hear or see anything of these strange, steeply pointed structures. They are usually less than 100 feet high and not as impressive and mysterious as those farther north beyond the Aswan Dam.

The Sudanese pyramids are smaller, steeper-sided, and more recent than those to the north in Egypt.

The Cushite kingdom's passion for pyramids was probably acquired in the Eighth Century B.C., when it actually ruled Egypt for a few years until the Assyrians pushed its armies back south in 671 B.C. With them, the Cushites took the pyramid idea, Egyptian art forms, and hieroglyphics. They liked pyramids so well that the Cushite rulers kept on building them until the kingdom's
demise in 350 A.D.------some 2,000 years after the Egyptians had abandoned this form of architecture altogether.

There is nothing in the Cush pyramids that can be called anomalous. It's just so surprising to learn there are so many of them and that they are so neglected in the TV documentaries.

The Cush empire did leave us one enigma: an alphabetical script of 23 symbols that has never been dociphered. P. Wolf, at Berlin's Humboldt Univer- sity, fears that, "Maybe we will never be able to decipher the language. Every- body is hoping for some sort of Rosetta stone." (For images of the script go to: http: //clearwater.nic.edu/socsci/jasylte/ Meroescript.htm)

(Anonymous; "228 Pyramids—South of Egypt in Sudan," Legendary Times, 2:3, March-April 2000)

REMARKABLE ANCIENT ROADS AND WALLS IN AFRICA

EARTH'S OLDEST PAVED ROAD

Forty-three miles Southwest of Cairo lies a basalt quarry favored by ancient Egyptian artisans. Oíd Kingdom crafts- men laboriously eut this hard, black, glassy rock into royal sarcophagi and pavements for the mortuary temples at Giza just outside Cairo.

To transport the heavy blocks of basalt from the quarry to Giza, the Egyptians built a quay on Lake Moeris, which then had an elevation of 66 feet above sea level and was located 7l miles southeast of the quarry. (The Lake is now much smaller and 148 feet below sea level, indicating a large climate change.) Then, when the Nile flooded and its waters reached a gap in the hills separating the Lake and the Nile, the Egyptians were able to float the blocks of basalt over to the Nile and down to Cairo.

Good thinking! But how did they transport the heavy blocks 7i miles from quarry to quay? The answer: What was apparently the first paved road on the planet. This 4,600-year-old engineer- ing feat averaged 61 feet wide and was paved with thousands of slabs of sand- stone and limestone, with some logs of petrified wood thrown in. Since the slabs show no grooves, it is thought that the stone-laden sleds moved on rollers.

(Wilford, John Noble; "The World's Oldest Paved Road Is Found near Egyptian Quarry," New York Times, May 8, 1994. Also: Maugh, Thomas H., III; "Earth's Oldest Highway," San Francisco Chronicle, May 22, .1994. Cr. J. Covey)

100-MILE-LONG WALL IN AFRICA

A 100-mile-long wall? Well, sort of! Sungbo's Eredo, as it is called, is really an earthen embankment with an accom- panying ditch. Whatever you cali it, it does endose an area 25 miles north-to- south and 22 miles east-to-west. That's a lot of earth-moving, for at some spots the "wall" measures 70 feet from the bottom of the ditch to the top of the embankment. Today, this impressive structure is mostly concealed by the Nigerian jungle. A thousand yea^s ago it enclosed a flourishing African kingdom.

Sungbo's Eredo is hardly a military structure. How could a 100-mile-long embankment be defended with a reason- able number of warriors? Instead, it might have been a boundary marker or perhaps a "spiritual barrier." In fact, shrines are located along the wall where locáis still leave offerings to protect themselves from outsiders.

(Onishi, Norimitsu; "A Wall, a Moat, Behold! A Lost Yoruba Kingdom," New York Times International, September 26, 1999. Cr. R. Swanson)

Comment. An interesting parallel to Sungbo's Eredo is seen in Offa's Dyke, the largest ancient earthwork in Britain. It is also an embankment-plus-ditch.
Offa, the king of Saxon Mercia, had it constructed between 757 and 796 to keep out the troublesome Welsh. Offa's Dyke is 150 miles long; its embankment is 25 feet high; the ditch 6 feet deep. It, too, is indefensibie. Today, it marks the boundary between England and Wales. Details in Ancient Infrastructure.

Map of some of the long dykes draped across the British countryside. These are similar in structure to Sungbo's Eredo in Africa. (From: Ancient Infra- structure)

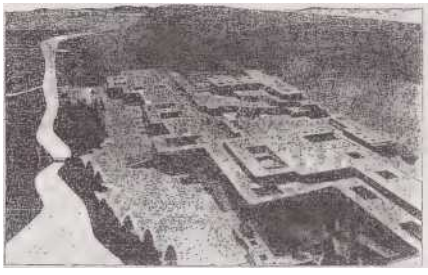
ASIA

CLA1MS OF SUNKEN CITIES AND MEGA-MEGAL1THS

TWO SUNKEN CITIES OFF THE COAST OF INDIA?

Culf of Cambay, India. We know virtu- ally nothing so far about two adjacent 'lost cities' reported to have just been discovered off the coast of India.

Archaeologists have recovered carved wood, pottery, pieces of sculpture and human teeth from a now sub- merged settlement in the Gulf of Cambay off Gujarat. Radiocarbon dating of one wooden sample suggests the settlement is around 9500 years oíd.
If the date is confirmed, the site " would be the world's first known 'city'.



An artist's conceptual sketch of one of the two purported sunken cities in waters 180 feet deep off the coast of India. The sketch is based on sonar data and, inevitably, some imagination!

In fact, this sunken settlement would be 4,500 years older than the first comparable cities in Mesopotamia and the Indus Valley.

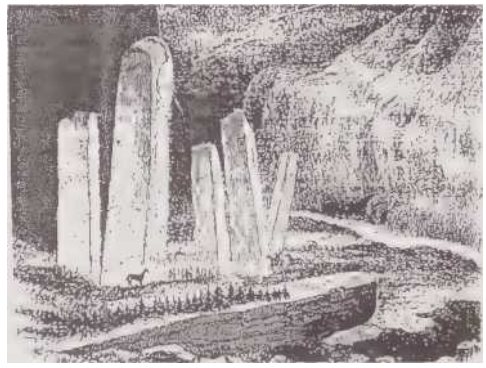
The two cities are each about 5 miles wide and repose in 120 feet of water. Sonar scans have discerned many lar ge, regular patterns that might represent buildings.

(Lister, Sam, and Teeman, Tim; "Lost Cities Show Civilization Began 9,500 Years Ago," London Times, January 19, 2002. Cr. D. Phelps. Anonymous;
" Sunken City," New Scientist, p. 13, January 26, 2002.)

A MEGA-MEGALITH?

A reader of our eatalog volume, Ancient InfrastT-u, , e, informs us that in our rambles through the areheological litera- ture we may have missed the "mother of all megaliths."

The sketch por+rays the Tombs of tb'- Gunii, as they appeared circa 1876. These towering standing stones were— and perhaps still are—located on the



The Tombs of the Genii. Note the tiny horsel Apparently, these huge mono- liths do exist but have a natural origin. See p. 10 for smaller examples of a similar geological phenomenon.

Kora River in what was Soviet Turkestan, Siberia. When you learn of their sizes, you'll realize that these lithic monsters must still be there, because modern machinery would be taxed to nudge them.

The largest of these standing stones rises 75 feet above ground level and probably penetrates 12 feet below. Its weight is in the neighborhood of 3,800 tons! This is more than 10 times the weight of Er Grah, the largest standing stone in Brittany and more than twice the size of the massive Trilithon still languishing in its quarry at Baalbek, Lebanon. This latter stone is routinely claimed to be the largest dressed mono- lith in the world. It isn't!

While the Siberian monolith is probably more recent than the Baalbek stone and not as finely ñnished, it is an unparal- leled example of stone quarrying, trans- portation, and erection. The stones of the Great Pyramid and those Easter Island statues are puny in comparison.

Who erected these giant megaliths and how did they wrestle them into place?

(Howard, John Eliot; "The Early Dawn of Civilization...," Victoria, Institute, Journal of the Transactions, 9:239,
1876. Cr. E. von Fange)

Those huge standing stones (the tombs of the Genii), located in a remóte región of eastern Asia, as reported above, just might be natural after all.
We have found a copy of the original 1860 source, and its author does not claim them to be artificial. In fact, his additional illustrations of some of the rock formations in the area indicate regular patterns of jointing that could well yield blocks similar to the mega- megaliths. The Genii, it turns out, were "powerful spirits," not flesh-and-blood people. More on this later as investiga- tion proceeds.

(Atkinson, Thomas Witlam; Travels in the Región of the Upper and Lower Amoor, New York, 1860.)

ANCIENT STRUCTURES AROUND THE PACIFIC RIM

The urge to fie the following two Ítems together was irresistible. Watch for thesi common elements: Ainu, Jomon, Caucasia

ENORMODS STRDCTÜRE IN JAPAN

At Aomori on Mutsu Bay, in northern Japan, archeologists have filled more tha 40.0 boxes with artifaets left by the Jomon people. The Jomon culture extendí over much of Japan in the period from 10.0 BC to 300 BC. Although the Jomo people are usually considered to have been hunter-gatherers, the Aomori site is demonstrating that they were much more sophisticated. They dabbled in agri culture (chestnuts, millet), traded for jade with Southern Japan (400 miles awaj and obtained obsidian from Hokkaido to the north across the Tsugaru Strait. Th most startling fínd at Aomori was a grou; of six enormous holes in the ground con- taining the remains of massive wooden pillars 1 yard in diameter. Apparently, some huge structure once existed at this site. The Jomon, it now appears, were more advanced socially and technologi- cally then previously believed.

The finds at Aomori have been stun- ning to not only the archeologists but also the Japanese people in general, for the latter take great pride in their Jomoi heritage.

Complicating this picture is the fact that analysis of Jomon skeletons suggest that the Jomon did not closely resemble most modern Japanese.

Instead, they had features that made them look more like Caucasians and they seem to have resembled the Ainu an ethnic group that still lives in tin? numbers in northern Japan. In the museum here in Aomori, Japanese tou- rists wandered by exhibits about the Jomon and gazed affectionately at pie- tures of what their Jomon ancestors are believed to have looked like------ even though the only one in the room who looked much like the pictures wa an American.

The Japanese population, in fact, is not as homogeneous as advertised. The natives of northern Japan tend to have rounder eyes, more body hair, and wide faces; that is, more of the Jomon char- acteristics. In the south, the Japanese have more Korean and Chínese characteristics.

(Kristof, Nicholas D.; "Out of the Mist Looms, Maybe, the First Japanese," New York Times International, April 2, 1999. Cr. M. Colpitts.)

Comment. From this starting point at Aomori, our tour moves north past Hok- kaido, where remnants of the mysterioui Ainu still hang on, to the Kuril Islands

The Ainu of northern Japan are stri- kingly different from most Japanese, as the above sketch proves. How far did this ancient seafaring race advance around the Pacific Rim? (Adapted from G, Thompson's American Discavery)

CIRCULAR STRUCTURES IN THE KURILS

Japan and Russia have been wrangling over the Kuril Islands for .years. The 56 islands in the group lie between Hokkaido and Kamchatka. With the Coid War over scientists have finally been able to visit these wild, inhospitable bits o£ real estáte. On uninhabited Onekota, a team of American, Japanese, and Russian biolo- gists, led by T. Pietsch, serendipitously carne across the undisturbed remains of several large, circular structures. The largest measured 22 meters (72 feet) across the circular embankment ringing a sunken center-----apparently once a large dwelling----and much like those of the ancient Ainu on Hokkaido. The Ainu, it seems, had colonized the Kurils in by- gone days.

The implications are far-reaching, for the Ainu were once a seafaring people with Caucasian physiological characteris- tics. It is only a couple hundred miles from the Kurils to the Aleutians and a foothold on North America. The specula- tion is that the Ainu could well have by- passed the vaunted Bering Land Bridge 10,0 years ago and continued pushing south along the North American coast.

(Holden, Constance; "Possible Ainu Site Creates Buzz," Science, 284:583, 1999.)

Comment. Continuing our tour south along American coast, we encounter the remains of Kennewick Man in Washington State with his Caucasian features. (p. 47)
Could he have been a far-wandering Ainu?

JAPANESE MINI-PYRAMIDS

Ln a recent issue of the Ancient American, Editor F. Joseph presented an intriguing photograph of a precisely sculpted pyramid crouching incongruous- ly amid the thick. trees and bushes of Mount Kasagi, in ,north-central Japan. Being only 7 feet high and 14 feet along its base, this edifice hardly challenges the classical pyramids of Egypt and Meso- america. It is, though, skillfully crafted from solid granite-:—almost a work of art. Age, sculptors, and purpose seem to be unknown.

Japanese cali it a "trigonon." It is not alone, for fourmore can be found strung along a ridge of Mount Kasagi about 100 meters apart.

(Joseph, Frank; "Ancient Wonders of Japan," Ancient American, no. 17, p. 27, 1997.)

Comment. We have not stumbled across reference to these "trigonons" before. Hopefully, some of our Japanese readers will enlighten us further.

OCEAN1A

NEW ZEALAND'S PURPORTED PRE-MAORI STRUCTURES

WHO BUILT THE KAIMANAWA WALL?

Some 30 kilometers south of Lake Taupo, in New Zealand, stands an enigmatic array of stone blocks. It. "looks" like a wall; a human-built wall. It also "looks" oíd; perhaps 2,000 years oíd according to some. Who built it? Passions are run- m'ngr high in New Zealand, where three hypotheses are being advanced:

(1) The wall was built some 2,000 years ago by the first settlers of New Zealand, the Waitahas, who were sub- sequently nearly exterminated by the Maoris, who arrived only 800 years ago. There are political problema with this theory, for the Maoris insist they are the original New Zealanders and there- fore are due compensation for lands expropriated by later Europeans.

(2) The wall is merely what's left of a sawmill built only 50 or so years ago.

(3) The wall is simply a natural rock formation that has happened to split neatly into rectangular blocks—like those slabs of beach rock that comprise the eontroversial Bimini "road" in the Bahamas.

Future study of the "wall" will doubtless narrow the list to one. Mean- while, let's take a look at the wall itself.

B. Brailsford, of Christchurch, has been the chief investigator of the Kaima- nawa wall, aided by American D.H. Childress, and others. The stones that make up the wall are 4-ton blocks of ignimbrite, a soft volcanic rock that could have been easily dressed with stone tools. The wall is topped by a red beech tree 2.9 meters in circum- ference and over a meter of accumulated humus. According to Brailsford, who was interviewed by the Listener:

> There was no doubt that the stones had been cut. The four visible stones in the front wall were a uniform 1.6 metres tall, and 1 metre wide. In one place he could insert his arm into a root-ridden cavity and feel the back face---and the front face of the next tier. The faces were uncannily smooth, with no saw or adze marks. The inter- stices where the blocks join were knife-blade thin.
>
> Further up the hill, the tops of other stones protruded, suggesting a more extensive structure was buried in the hill.

Supporting the contention that a pre-Maori people lived in New Zealand are the bones of the kiore, a type of rat alien to New Zealand, which was likely introduced by the first settlers. Some kiore bones have been dated as 2,000 years oíd—centuries before the first Maoris arrived.

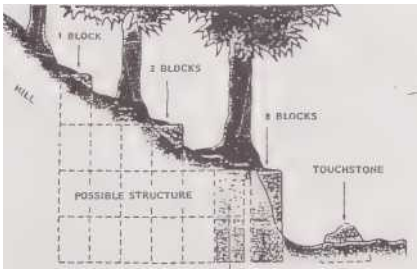
Needless to say, New Zealand arche- ologists and anthropologists are not

The Kaimanawa wall under investigation by B. Brailsford (above) and D. H. Childress (below). The stone blocks seem to be too regular to be a natural formation. (T. Brown)

anxious to drastically revise íheir fundamental paradigm assigning the diseovery and colonization of New Zealand to the Maoris. But Brailsford and Childress are even more iconoclastic: They suggest links to a pre-Polynesian culture; a culture that left similar megalithic struc- tures elsewhere in the Pacific and along the west coast of South America.

(Chapple, Geoff; "Megalith Mystery," Lis tener, p. 28, May 4, 1996. Anony-- mous; "Kaimanawa Wall a Natural Volcan- ic Rock Formation," New Zealand Herald, May 4, 1996. Wellwood, Elinore; "Experts Argüe over Wall's Origins," Waikato Times, May 8, 1996. Cr. T. Brown.)

Comment. See p. 32 for an apparently natural wall at Chatata, Tennessee, that stirred up a similar controversy over a century ago.



B. Brailsford's conceptual sketch of the cross section of the Kaimanawa wall, based on the observation of more than 15 stones. (Listener)

CRACKS IN THE KAIMANAWA-WALL STORY?

It was bound to happen. The publieity accorded the Kaimanawa Wall by New Zealand newspapers (above) stimulated the seientific community to take a cióse look at the controversial "wall." The New Zealand Department of Conservation asked geologist P. Wood for his assess- ment.

He identifíed the rock as the 330,000-year-old Rangitaiki Ignimbrite. Fol- lowing the line of blocks both hori- zontally and vertically, and photo- graphing them in series, he revealed a system of joints and fractures natural to the cooling process in ignimbrite sheets. What Brailsford [see above] had taken to be man- made cut, stacked blocks were no more than a type of natural rock formation.

P. Andrews, the author of this arti- cle likened the regular jointing of the "wall" to neatly hexagonal prisms seen ín many basalt flows. He supplied two photographs of the "wall." One was like the photo on p. 21 and showed regular joints; the second, from the same out- crop, displayed angled fractures and joints that certainly do not look like the work of humans.

(Andrews, Philip; "New Zealand: Recent Aᶜh, Ancient Wall," Geology Today, p 136, July-August 1996. Cr. R.E. Molnar)

Comment'- . If wr receíve counter-argu- mer.ta f_{ru}.ii proponents of the wall's artificiality, we will add them to this dossier.

A similar situation occurs with the more- famous Bimini "walls" or "roads." We have personally seen beach-rock de- posits so regularly jointed that they seem man-made. See Ancient Infrastruc- ture. ■

PARADIGM ASSADLTS FROM WAY DOWN UNDER

A lengthy article in an Auckland news- paper demonstrates that areheological revisionism is alive and well in New Zealand. We select just three of the more controversy-provoking topics.

(1) G. Cook, assisted by a few like-minded compatriots, has been exploring the Waipoua Forest in Northland. Here, he claims, is a treasure trove of pre- Maori stone structures. In a 242-hectare area, he has found 16 sites encompassing nearly 2,000 enigmatic stone structures.

Interestingly, the New Zealand govern- ment has made a three-year survey of the area and has embargoed release of their report until 2063! (Ofñcial cover- ups are also found in archeology.)

(2) B. Brailsford, of Kaimanawa Wall fame (above), now asserts that the Maoris were preceded by the Waitaha----- a claim eehoed by others. But Brailsford goes a step further by stating that the Waitaha really comprised three disparate groups of people: (a) the Moriori, who were of giant stature and superb gar- deners; (b) the Urukehu, a fair-skinned group known also as Starwalkers for their knowledge of the heavens; and
(c) the Kiritea or Stone People from Asia.

(3) Finally, stated sans reference, is the fact that in 1996 rock carvings 14,0 years oíd were found along a 49-kilometer stretch of the Amazon.

(Paterson, Kimberly; "Pushing History Back beyond Our 'Real Time'," Auckland Sunday Star-Times, April 19, 1998. Cr. T. Brown)

CLAIM OF UNDERSEA STRUCTURE NEAR OKINAWA

A CONTINENT LOST IN THE PACIFIC OCEAN

Our title is also the English title of a book published recently in Japan. The subtitle quoted below implies that we are not discussing the supposed lost continent of Mu.

> Riddle of the Submarine Ruins in the Ryukyu Islands

Rather, the underwater site is that in- troduced above and located Southwest of Okinawa. It is hardly the size of a continent!

The book's author is Masaaki Kimura, and he has filled his book with stunning underwater photographs and diagrams of this "lost continent." Unfortunately, except for a Contents page, which is in English, the rest of the book is in Japa- nese. We'll have to settle for the Contents page, which is rather revealing.

1. Human Beings under the Sea
2. The Submarine Ruins Discovered
3. Were the Ryukyu Islands a Continent?
4. Diseovery of a Civilization Lost in the Sea
5. An Ancient Civilization in Southernmost Japan
6. A Continent Lost in the Pacific Ocean
7. Submersion of the Land and Tectonics of the Earth
8. Hypotheses for the Land Lost in the Pacific Ocean
9. A Utopia Sunk in the Pacific Ocean

Pretty inflammatory stuff, so much so that we must be wary indeed!

One of the drawings in our photocopy is good enough to reproduce here. The immediate impression, as with many of the underwater photographs, is that surely this structure is artificial. But we must remember that Nature has her playful moods and has deposited simula- era everywhere, perhaps.even on Mars, certainly with the Grand Tetons!

(Kimura, Masaaki; A Continent Lost in the Pacific, all other bibliographical data in Japanese. Cr. R. Molnar)

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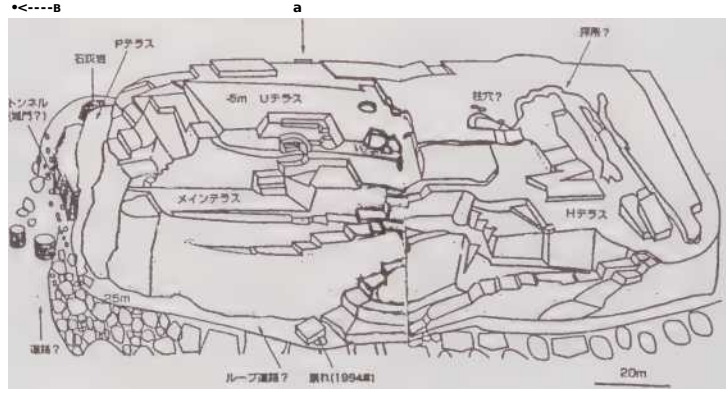


This section of Kimura's "lost continent," as taken from his book,is only ábout 180 meters long. Is this structure natural or artificial?

ASTODNDING UNDERSEA STRUCTURE NEAR OKINAWA

A structure thought to be the world's oldest building, nearly twice the age of the great pyramids of Egypt, has been discovered. The rectangular stone ziggurat under the sea off the coast of Japan could be the first evidence of a previously unknown Stone Age civillzation, say archeo- logists. •

Wow! Is this true? This so-called "struc- ture" ib 600 feet long and 90 feet high. Sald to be about 10,000 years oíd, it obviously predates the edifices of the ancient Egyptians and Babylonians. The "structure" is now under about 75 feet of ocean near a small island named Yonaguni Southwest of Okinawa. During the Ice Ages, it would have been exposed, just like the Bering Land Bridge to the north.

Of course, the crucial question is: Is it really artificial? R. Schoch, the Boston University geologist who vouches that the Sphinx is also about 10,000 years oíd (vol. 1, p. 131) described the "structure" as a series of huge steps about 1 meter high. Schoch is- impressed by the regularity of the steps, but does not discount a natural origin.

A photo taken by divers does reveal a remarkably regular, stepped surface, but nature can be very methodical on occasion. Adding to the artificiality of the "structure" is the claim that a "road" endoses it.

(Barot, Trushar; "Divers Find World's Oldest Building," London Times, April 26, 1998. Cr. A.C.A. Silk & D. Phelps)

Comments. If this submerged "structure" is really man-made, it would make Hap- good's Maps of the Ancient Sea Rings more plausible.

Other nicely regular "structures," very likely natural, are: the Giant's Causeway, the Bimini Road, the Kaima- nawa Wall, the Face on Mars, etc. See also p. 20 for discussion of possible sunken cities off the coast of India.

UNEXPECTED STRUCTURES ON REMOTE PACIFIC ISLANDS

THE PIGEON-SNARING MOUNDS OF TONGA

In North America, the industrious Moundbuilders excavated untold millions of basketfuls of soil which they piled up in impressive mounds. Flat-topped Monk's Mound at Cahokia, Illinois, rivals the Great Pyramid in volume. A casual ob server of this huge earthen structure could only conclude that such immense labor was undertaken for some social imperative, such aB worship or sacrifice. Perhaps this was the case in North America, but deep in the South Pacific, just east of Fiji, on the islands of Tonga, native peoples scraped large mounds of earth for what seeras to be a frivolous purpose: pigeon-snaring!

But bear in mind that carnivory on these romantic Pacific islands was diffi- cult because large game animáis were nonexistent. Captured enemies helped solve the protein probiem, but pigeons were much more common, and some spe- cies were good-sized and delicious. So much so that eventually only island royalty was allowed to catch and eat them. Pigeon poachers were whipped or exeeuted (and maybe eaten?) In fact, pigeon snaring became a royal sport.

To this end, starting at least a thou- sand years ago, the king's loyal sub- jects grubbed up the thin island soil and piled it up into high mounds.

Tonga's pigeon-snaring mounds did not compete with Monk's Mound sizewise, being at most 115 feet in diameter and perhaps 15 feet high. But that's still a lot of dirt. On the tops of the mounds were smaller, beehive-shaped mounds with vertical slits in them large enough to conceal a human. From these blinds, the king and princes would swing nets on the ends of 12-foot poles to catch pigeons.

A 1793 sketch of a pigeon-snaring mound on Tongatapu. The pigeon snarers hid in slits in the small, beehive-shaped mounds on top of the main mound.

Of course, no self-respecting wild pigeon would ever fiy over such a sus- picious hill without some enticements. So, captive pigeons caged on the mound were set to cooing and other pigeons tethered by long strings were launched. Sure enough, wild pigeons were lured cióse enough to be snared.

(Burley, David V.; "Sport, Status, and Field Monuments in the Polynesian Chief- dom of Tonga: The Pigeon Snaring Mounds of Ha'apai," Journal of Field Archaeology, 25:421, 1996.)

Comment. Now let's see, in the heyday of the Moundbuilders, the North Ameri-' can skies were darkened by flocks of Passenger Pigeons. Hmmml

THE ROADS OF EASTER ISLAND

When the Fourth Dynasty Egyptians set about building the Great Pyramid, they built a stone-paved road from the Giza Plateau to the dock on the Nile where barges arrived from quarries upriver. The road's hard, smooth surface eased the task of hauling the huge blocks of limestone and granite to the construction site. Three thousand years later, the Easter Islanders faced a similar trans- portation probiem in moving their huge stone heads —some weighing as much as 90 tons—from the quarries to stone platforms (ahu) on the coast, where the monstrous heads would stare out across the empty Pacific.

Much has been written about how the more than 800 stone heads were dragged from the quarries by brute forcé and then erected on the ahu. Thor Heyerdahl and others have even managed to dupli- cate some phases of the operation. How- ever, the voluminous Easter Island literature is not as forthcoming about the roads the natives built to accelerate this lithic traffic. The Easter Island roads have turned out to be as curious as the statues themselves.

During the sumroer of 2000, geologist C. M. Love and a crew of 17 students excavated sections of the three main roads that carried statue traffic. Parts of these roads were aetually carved into the island's bedrock—lava flows mainly. Strangely, the roads were not fíat but V- and U-shaped in cross section. They averaged 3.5 meters (11.5 feet) wide and were not a trivial undertaking. In some sections, the roads were flanked by lines of rocks. Sometimes these curb- stones were accompanied by pits gouged out of the solid rock, üsually, the pits occurred where the roads sloped uphill. Love speculates that the pits were dug to accommodate some "mechanism" in- vented to help move the multi-ton heads up the inclines—a primitive cog railway of sorts.

The pits and V-shaped profiles sug- gest that we still have much to learn about the Easter Island roads and exact- ly how the ponderous heads were moved.

(Love, Charles M.; "The Easter Island Mystery," Discovering Archaeology, 2:12, December 2000)

SMALL ARTIFACTS

NORTH AMERICA

The most common vestiges of ancient humanity are not pyramids and other engineering works, but rather arrowheads, pottery fragments, and the like. These "small" artifacts may suggest at least two sorts of anoma- lies: (1) unexpectedly "high technlogy" for their time frame; and (2) evi- dence for cultural diffusion that challenges prevailing paradigms that concern the peopling of the planet.

Focussing on North America, we find that the 1994-2003 issues of Science Frontiers deal mainly with the second potential category of anomalies —that is, cultural diffusion. We divide the material into two major groups.

•Pre-Clovis artifacts. Claimed evidence of humans in North America prior to about 12,000 BP. New evidence comes from the Topper and Cactus Hill sites in eastern North America.

•Scientific doubts about Pre-Clovis contacts.

PRE-CLOVIS ARTIFACTS

THE POWER OF A PARADIGM

Powerful paradigms can stifle seientific research. The truth of this has become apparent at the Topper archeological site near Atiéndale, South Carolina. The dig was discovered back in 1981 when a local man, named Topper, led A. Goodyear (from the University of South Carolina) to a deposit of side-notched chert points. These artifacts are similar to 10,000-year-old points found elsewhere. Nothing anomalous so far! At depths of 80-100 centimeters, Goodyear carne across fluted blanks from whieh the classic and distinctive Cío vis points could be manufactured. This was the culmination of the dig; the archeologists picked up their trowels and headed for other sites. Why? Simply because everyone knew that there were no North American artifacts older than Clovis points. Dated at 10,800-11,200 radiocarbon years, Clovis points supposedly marked the earliest arrival of humans in the Americas. Dig- ging deeper at the Topper site would have been a waste of time.

In 1998, however, Goodyear had second thoughts. This was the time when the nothing-older-than-Clovis paradigm was being challenged by finds at Monte Verde, Chile, (p. 26) Goodyear de- cided to take his trowels back to the Topper site.

After some 40 cm of essentially bar- ren deposits, the excavators began finding small flakes and microtools. The lower level, exposed over 28 square meters, has yielded some 1,000 waste flakes, 15 microtools (mostly microblades), and a pile of 20 chert pebbles plus four possible quartz hammerstones.

Goodyear thinks that chert pebbles were being processed at Topper 12,000-20,0 years ago. Apparently, North America has its own Monte Verdes!

(Anonymous; "Pre-Clovis Surprise," Archaeology, 52:18, July/August 1999.)

Comment. Shouldn't Goodyear keep on digging at Topper? Should we be satis- ñed with Relativity, the Big Bang, Píate Tectonics, Neo-Darwinism, etc.? See the following closely related Ítem.

A typical Clovis point. The digging 'at Topper "should" have stopped at this level if one adhered to the Clovis- first paradigm.

STILL ANOTHER EAST-COAST PRE-CLOVIS DIG

Above, we reported on the Topper pre- Clovis site in South Carolina, where stone tools tentatively dated as 12,000 20,0 years oíd were excavated. Finds like this challenge the claim that the Americas host no artifacts earlier than 11,500 B.P., when the Clovis people first traipBed across the Bering Land Bridge.

Now, on a sandy rise, oalled Cactus Hill, some 45 miles south of Richmond, Virginia, archeologists have uncovered another apparently pre-Clovis site. An upper level at Cactus HiH, dated at 10,920 B.P. do es contain typical Clovis artifacts. These are warmly received by mainstream archeologists for they support a highly cherished paradigm.

But only 6 inches below the Clovis level, the diggers gingerly brushed the dirt off crude projectile points that were clearly not of Clovis manufacture. This level seems to be about 5,000 years older than the Clovis level according to radiometric dating of chareoal.

Skeptics suggest that there has been mixing of the sandy soil and that these early dates are suspect. But thermo- luminescent dating has confirmed the 5,000-year time gap. Thorough analyses of the soil with its plant and animal re- mains indicated little if any mixing.

D. Stanford, from the Smithsonian Institution, asserts that these purported pre-Clovis projectile points resemble those common in Europe in the same time period.

From all this, it seems that Europeans may have preceded the Clovis immigrants from Asia. Archeology, it seems, is being rocked by a powerful paradigm shift!

(Stokstad, Erik; "'Pre-Clovis' Site Fights for Recognition," Science, 288:247, 2000. Bower, B.; "Early New World Settlers Rise in East," Science News, 157:244, 2000. Todt, Ron; "Site May Settle lst Americans Debate," Austin American Statesman, April 9, 2000. Cr. D. Phelps. Anonymous; "Settlement Proves First U.S. Immigrants Arrived Earlier," Oil City Derrick, April 9, 2000. Cr. E. Fegert)

QRIGIN OF CLOVIS CDLTDRE DISPDTED

The Clovis people, as identified by their distinctive fluted points, are almost uni- versaUy considered to have originated in northeast Asia, migrated across the Bering Stvait, and pushed southward into the New World.

The problem with this scenario, ac- cording to M. Faught, at Florida State University, is that the distribution of Clovis points in space and time does not refleet this route of cultural diffusion from Asia.

He points out the lack of fluted points in the ice-free corridor of Idaho, Wyoming, and northern Montana that is assumed to have existed before 11,000 B. P. In fact, before 11,000 B.C., the Clovis points seem limited to the American Southwest. After about 11,000 B.P., Clovis points are found not only in Alaska but over much of the Lower-48.

Faught's claim is that the Clovis culture did not origínate in Asia but rather in the American Southwest.

(Faught. Michael K.; "Rethinking Clovis Origins," Mammoth Trunroet. 18:12. September 2003.) —

ANTHROPOLOGY DNBOÜND

When careful dating at the Monte Verde Rite in Chile finally smashed the Bering Stralt par adi gm (p. 26). it was if Science had been unchained. Ideas and data that have long been suppressed in fear of profes sional retribution are now appearing. At the February 1998 annual meeting of the American Association for the Advancement of Science (AAAS) in Philadelphia, anthropological heresies ran rampant.

D. Stanford, Smithsonian curator of archeology, opined that there were probably several waves of prehistoric immigration into the Americas across the Arctic, the Pacific Ocean (!), and possi- bly even the Atlantic (!!). [This is heresy no longer.] Supporting early Atlantic crossings are several dozen artifacts found in the eastern Ü.S. that closely resemble some found in France and Iberia. Stanford said, "We don't know yet what that means."

(Lore, David; "Bering Strait May Not Have Been Only Route to Americas," Columbus Dispatch, February 17, 1998. Also: Gibbons, Ann; "Mother Tongues Trace Steps of Earliest Americans," Science, 279:1306, 1998.)

Comment. The Bering Strait fetters have been struck. Above we even see hints that ancient seafaring will soon be allowed.

Apparently epigraphic heresy, á la B. Fell, remains anathema. Also verboten: Pedra Furada, that 50,000-year-old site in Brazil. (p. 26)

1999 PARADIGM QUAKE: THE SOLUTREANS WERE HERE FIRST!?

It's not just a paradigm shift, it's a paradigm "quake." The Bering Land Bridge theory is being superseded by the Solutrean Hypothesis. Of course, it will be a contentious, long-drawn-out transition; but it is as dramatic in archeology as the discovery of X-rays was in physics a century ago.

The artifactual basis for the Solutrean Hypothesis consista of projectile pointB and blades found along the east coast of North America that are virtual- ly indistinguishable from those manu- factured by the Solutrean culture that flourished in Spain, Portugal, and southwestern France 20,000 years ago.

Promoters of the Solutrean Hypothesis assert that adventurous inhabi- tants of the Iberian Península made Atlantic crossings in skin boats. With the help of the favorable cúrrente and benign weather, they could have made the Crossing in about three weeks. Die- bard ehampions of the Bering Land Bridge ridicule such early trans- Atlantic crossings. Yet, South Pacific islanders had been making long ocean voyages for some 20,000 years before the Solutreans set sail.

No one denies that some immigrants to the Americas used the Bering Land Bridge; it is just that they were late- comers. Archeological sites in Pennsyl- vania, Virginia, and South Carolina (p. 24) dating back 15,000-18,000 years demónstrate that the ocean-going Solutreans had footholds in the Americas 3,000-6,000 years before Asían landlubbers trekked into Alaska.

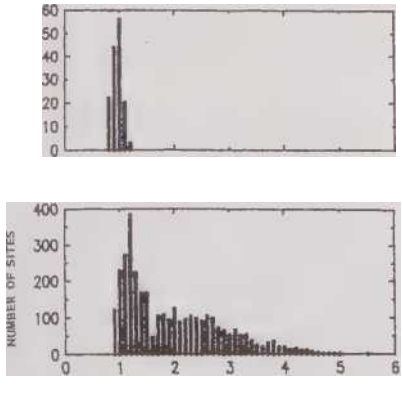
(Anonymous; "Origins of Prehistoric North Americans in Dispute," Baltimore Sun, November 1, 1999. Verrengia, Joseph B.; "Are You a Clovis or a Solutrean?" Associated Press, Fox News- wire, October 31, 1999. Cr. M. Col- pitts.)

SCIENTIFIC DOUBTS ABOUT PRE-CLOVIS CONTACTS

BLACK-BALLING VERY EARLY AMERICANS

In past issues we have introduced the so-called "Clovis Pólice," who have tried to scuttle ah talk about humans traipsing around North America before about 12.0 BP; that is, before the Clovis culture took hold. These "Pólice" assured that one could not be a mainstream arche- ologist or acceptable "colleague" if one believed otherwise. Well, the Clovis Limit has now been relaxed to about 15.0 BP, but the Clovis Pólice still patrol the halls of academe.

Control of heretics is more subtle now. We see this in recent study of dates ascribed to ancient sites on three conti- nents (North America, Australia, and Europe) by scientists from each of the continents. The control- technique con- sists of colleeting these dates daimed for sites on said three continents by the various researchers—both heretics and mainstream scientists. (Of course, there is nothing wrong or even unusual in preparing such overviews.) But then the authors of the study asked Belected professional archeologists from each continent to comment on the validity of the collected dates for the sites on his/her continent. If more than one expert expressed doubts about a site, it was expunged from the list. In other words, just two professional archeologists (bound to mainstream Science) could blackball a site. It was really very easy, given the eutthroat politics North American archeology, to elimínate North Ameri-



Sites generally accepted by mainstream archeologists. (Top) sites in North America. (Bottom) sites in Europe. The ■ effect of the Clovis-first paradigm is easily seen.

can sites older than 15,000 BP. The study resulted in the severely date- truncated histogram for North America shown here. The authors' conclusión was inevitable.

> **By the principie of Occam's Razor, it seems best to assume that humans were probably not present in North America before 25,000-15,000 B.P. and most likely arrived towards the end of this period, when high-latitude environ- ments across Beringia became warmer and moister.**

(Adams, J.M., et al; "Could Pre-Last Glacial Humans Have Existed in North America Undetected? An Interregional Approach to the Question," Current Anthropology, 42:563, 2001.)

Comment. What a setup! Anything can be proven given the right jury!

CLOVIS POLICE ARE BACK IN ACTION

Just because you read a lot in Science Frontiers about pre-Clovis sites (those New World digs asserted to be older than 12,0 years), do not imagine that all archeologists embrace these claims. For example, a recent issue of Discovering Archeology (Now defunct) debunked them at great length and rather testily to boot. This broadside was followed by a devastating review of T.D. Dillehay's The Settlement of the Americas: A New Prehistory in the magazine Natural History.

The reviewer for Natural History, A.C. Roosevelt, a respected anthropolo- gist at the University of Illinois, targets the Cactus Hill site, in Virginia (p. 24). This dig, she says, is characterized by "inconsistent dates, vague stratigraphy, and inadequate artifact samples that dis- qualify them from scientific acceptance." Even Dillehay's monumental work at Monte Verde, Chile, does not survive the review unscathed. In fact, the claimed pre- Clovis sites, according to Roosevelt, do not yield sound, consistent radiocarbon dates earlier than 11,500 B.P. She will, however, entertain Bering Strait crossings as early as 12,000 B.P., but not a microsecond earlier.

(Roosevelt, Anna Curtenius; "Who's on First?" Natural History, 109:76, July- August 2000.)

Continuing the assault on pre-Clovis thought is L.G. Strauss, an anthropolo- gist from the University of New México. His target is the theory that the Solutrean people of souther.n France and the Iberian Península reached eastern North America before the Clovis culture took hold on the continent. (above) His ammunition comes in four calibers:

•The Solutrean culture in Europe ended circa 16,500-18,000 B.P., some 5,000+ years before Clovis. Too early.

•Iberia and North America are sepa- rated by 5,000 kilometers of ocean. Too wide.

•Genuine Solutrean artifacts differ markedly from those at claimed pre- Clovis sites. Too disparate.

•There is no evidence that the Solu- teans possessed adequate marine techno- logy and experience. Too unreasonable.

(Strauss, Lawrence Guy; "Solutrean Settlement of North America? A Review of Reality," American Antiquity, 65:219, 2000)

SOUTH AMERICA

As in North America, some small artifacts found in South America hint at Precolumbian contacts. In actuality, the evidence for Pre-Clovis humans in South America is more persuasive than it is in North America. The startling implication is that South America may have been peopled before North America! These postulated early South American arrivals may not have come from northeast Asia across the Bering Land Bridge.

«A consensus on the Monte Verde site? More and more archeologists and anthropologists have been convinced of the great age of this Chilean site.

«Pedra Furada problems. This Brazilian site is highly controversial.

«Artifacts with Australian innuendoes.

A CONSENSUS ON THE MONTE VERDE SITE?

WE'VE KNOWN IT ALL ALONG!

An archeologist really risks his or her reputation if he or she suggests that the Americas were peopled before 12,000 years ago. At least that's the way it was until early 1997, when a select "jury" of a dozen skeptical archeologists visited the Monte Verde site in Southern Chile. There, T. Dillehay, made his case for a culture that preceded North America's Clovis culture by at least 1,000 years. Monte Verde artifacts go back at least to 12,500 years before the present. The Monte Verde tour, backed by two very detailed reports, convinced some of the most obstinate skeptics. The "jury" was ‘in," and the Clovis culture was "out," at least as being the first New World culture.

Naturally, some still-skeptical archeologists bristled at the suggestion that a "jury" could decide for them. [But isn't that the way Science always works?] Regardless, the once formidable 12,000-year barrier now seems to have been officially breached. *1

The Monte Verde dates imply either:

(1) The Bering land bridge, thousands of miles to the north, was crossed a few millennia before 12,500 BP, or

(2) The Monte Verde people arrived by some other route, perhaps by ship!

(Wilford, John Noble; "Human Presence in Americas Is Pushed Back a Millenmum," New York Times, February 11, 1997. Cr. M. Colpitts. Also: Meltzer, David J.; "Monte Verde and the Pleistocene Peopling of the Americas," Science, 276:754, 1997.)

Comment. Two delicious ironies emerge from this areheological turning point:

(1) The "We knew it all along" phase of the paradigm shift has appeared. K. Butzer, University of Texas, said that Monte Verde has been "uncontroversial" for some time. But it was only in 1990 that the "Clovis Pólice" insisted that the 12,000-year barrier be moved back to 11,500 years. (vol 1, p. 22)

(2) T. Dillehay, Champion of the antiquity of Monte Verde, is one of the main critics of N. Guidon's dating of Brazil's Pedra Furada site at 50,000 years. (p, 26) Yet, Dillehay's team
is finding dates that seem to be over 33,0 years just 70 meters from the Monte Verde 12,500-year dig.

However, see below for severe profes sional criticisms leveled at the Monte Verde findings.

WHERE DID THEY COME FROM?

It appears more and more likely that South America was colonized earlier and separately from North America. Reason #1 is that the oldest recognized sites in North America are only 11,200 years oíd, while the Monte Verde site in Southern Chile is now generally admitted to be 12,500 years oíd. Reason #2 is the dis- tance gap of about 5,000 miles between the two sites. So far, there is no evi- dence of cultural continuity.

The time gap is likely to enlarge in a huge quantum jump because of exca- vations at an intriguing green knoll at Monte Verde. Some 6 feet below its sur- face is a sedimentary layer containing charcoal in clay-lined pits and human- fractured pebbles. This sedimentary layer is carbon-dated at 33,000 years ago—some 20,000 years before the an- cestors of North America's Clovis people are said to have trekked across the Bering land bridge.

(Wilford, John Noble; "Chilean Field Yields New Clues to Peopling of Americas," New York Times, August 25, 1998. Cr. M. Colpitts)

New Clues. Just to *the* north of Monte Verde, on the coast of Southern Perú, traces of a hitherto unknown, 11,000- year-old maritime culture have emerged. For short, the new site is called QJ-280 (for Quebrada Jaguay 280). QJ-280 is now about 2 kilometers inland from the Pacific Ocean. But 11,000 years ago, sea levels were lower, and it was 7-8 kilo- meters inland. This site is littered with' the bones of fish and marine birds, such as cormorants. The people of QJ-280 were obviously familiar with the sea and exploited it almost exclusively. Whence this maritime culture? Did they come down the coast from North America or across the wide Pacific?

Further, the OJ-280 site has yielded obsidian, which could only have come from the highlands 130 kilometers to the east. Did the QJ-280 mariners penétrate that far inland, or did they trade with an unrecognized highland culture?

Finally, equally oíd Paleoindian sites have been researched by A. Roosevelt in the lowlands near the Atlantic coast a continent away. These jungle cultures had developed entirely different ways of living from the others just men- tioned. In this context, Roosevelt com- mented:

> There's no apparent ancestral relationship between Clovis and these people in South America.

(Pringle, Heather; "Traces of Ancient Mariners Found in Perú," Science, 281: 1775, 1998. Sandweiss, Daniel H., et al; "Quebrada Jaguay: Early South American Maritime Adaptations," Science, 281:1830, 1998.)

PEDRA FURADA FROBLEMS

THE 50, OOO-YEAR-OLD AMERICANS OF PEDRA FURADA

French archeologists (not American) have established to the satisfaction of most European archeologists (not American) that humans were present in Brazil at least 50,000 years ago. F. Parenti, with N. Guidon, presented their data at a recent Paris' meeting. The main site studied was the sandstone rock shelter of Pedra Furada, which is one of several hundred painted rock shelters discovered in northeastern Brazil. Guidon began her work in 1978; Parenti, in 1984. The four- volume, 7-kilogram report (aetually Par- enti's doctoral thesis) concentrates on three lines of evidence:

- A coherent series of 54 radiocarbon dates ranging from 5,000 to 50,000 years.
- Crudely flaked stones, some 6,000 of which are deemed of human manufacture, even when the most stringent cri- teria are applied. Many of these carne from Pleistocene strata 50,000 years oíd or older.
- Some 50 Pleistocene "structures" consisting of artificial arrangements of stones, some burned, some accompanied by charcoal. These are likely ancient hearths.

(Bahn, Paul G.; "50,000-Year-01d Amer- ieans of Pedra Furada," Nature, 362:114, 1993.)

Comment. With the Brazil and Chile (Monte Verde) sites looking more and more eonvincing, it is reasonable to ask why even older sites have not been found in North America, which is nearer the famous Bering Land Bridge. As a matter of fact, controverted human arti- facts, very similar to those at Pedra Furada. have been found at such sites as Calicó Hills, California. These are claimed by some to be much older than 50,0 years. It will be interesting to see how the Pedra Furada data are re- ceived in the States.

Such reactions, from later issues of Science Frontiers, are presented below.

DARWINISM IN ARCHEOLOGY!

Archeologists were initially attracted to Pedra Furada, in northeastern Brazil, by the area's rich and color ful rock art, some of which would not be allowed on the Internet! But it is not the-rock art that is controversial about Pedra Furada; it is the 595 pieces of quartz selected by French archeologist N. Guidon. These bits of stone closely resemble human- crafted choppers, scrapers, and cutting tools. Indeed, if they had been found in more recent deposits, they would have been judged "man-made" by everyone. The trouble is that Guidon has dated them at 50,000 BP—a date mainstream archeologists cannot swallow. Any New World dates earlier than 12,000 BP, maybe 20,000 BP for a few daring souls, have to be erroneous.

How are the Pedra Furada chipped stones explained by mainstream archeologists? They are "geofacts, not artifacts. They were created when quartzite rocks were released by erosión and fell off cüffs to be smashed upon impact below. Gravity and not the human hand broke the quartz into pieces that just happen to look like prehistoric tools. F. Parenti, a coworker of Guidon, has tried to ex- orcise the geofact argument, which is used wherever tools are "too oíd", by showing that the 595 pieces of quartz have characteristics quite unlike those created by natural flaking.

The doubters are unswayed. You see, despite Parenti's analysis, there remains a minute chance that a falling rock will fracture into pieces, one of which will look human-made. Maybe only one falling rock in 10,000 will fracture "unnaturally;" make it one in 10,000,000; it doesn't matter. Anthropologist D. Meltzer writes:

> Of course, no matter how rare the chances, given sufficient time and raw material----Pedra Furada had plenty of both—nature can magnify even the slimmest odds to the point where geofacts occur in detectable frequencies.

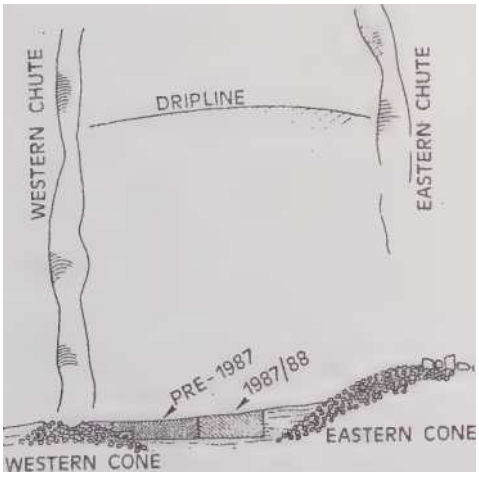
In this argument, you see how our title "Darwinism in Archeology" carne to be. Random events (rock falls or muta- tions) plus a sorting mechanism (human selection or natural selection) can produce geofacts or new species. This sort of explanatory mechanism can, in principie, explain just about anything!

(Meltzer, David; "Stones of Contention," New Scientist, p. 31, June 24, 1995.)

R. Dennell and L. Hurcombe, two archeologists faced with the geofact problem at their Pakistán dig, tried to solve it experimentally. They deliberately drop- ped quartzite rocks from heights onto hard surfaces. They concluded:

> While conceding that had we conducted the experiment with a thousand, ten thousand, or a hundred thousand stones, a few might have fractures, we would nevertheless maintain that the chances of any showing múltiple, multi- directional flaking and all with bulbs of percussion are as remóte as the proverbial monkey typing Shakespeare.

(Dennell, Robin, and Hurcombe, Linda; "Comment on Pedra Furada." Antiquity, 69:604, 1995.)



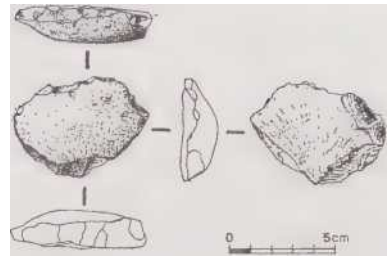
Frontal sketch of the Pedra Furada site in Brazil. The high rock overhang can been see only in a side view.

DEFLATING A PARADIGM: BRAZIL'S PEDRA FURADA

The paradigm. The New World was peopled irom Asia by migration across the Bering Land Bridge about 12,000 years ago, or perhaps a wee bit earlier.

The Pedra Furada site has been dated at 50,000 BP by N. Guidon and her team of archeologists. This challenge to the dominant paradigm is powerful and unambiguous. Picking up the gauntlet, several more-conservative archeologists visited the Brazilian site and penned a blistering critique in Antiquity. (Ref. 1) Their major contention was that the 500+ supposedly human-made stone "artifacts" collected by Guidon's team are actually "geofacts"; that is, they were chipped and flaked naturally as rocks fell one upon the other from nearby cliffs. We discussed this problem in some detail above.' Several other reservations about the Pedra Furada work are also offered in Ref. 1.

The reaction of Guidon et al to the Antiquity paper was thunderous to say the least. It revealed the depth of the chasm separating archeologists on the date of human occupation of the New



A "blunt- point," one of the thousands of controversial stone artifacts found at Pedra Furada.

World as well as internecine politice in archeology. (Ref. 2)

Guidon et al flung two serious charges at the authors of the flrst Antiquity paper: (1) They had their facts all wrong; and (2) Their objectiv- ity was distorted by their loyalty to the aforestated paradigm. Not withholding any punches, N. Guidon and A.-M.
Pessis entitled their opening broadside: "Falsehood or Untruth"! They wrote:

> The article by Meltzer et al (1994) is based on partial data and f&lse information (highlighted below). Its battery of questions takes us by sur- prise; none of the three colleagues carne up with these questions during the 1993 meeting—mounted precisely to generate direct dialogue on the peopling of the America. We disagree with their statement, 'the comments on Pedra Furada are not offered light- ly' (p. 696). The eommentaries are worthless because they are based on partial and incorrect knowledge.
>
> We believe that the initial intention of the authors was different; they got carried away into an exercise in academia style, from a fragile scien- tific base of fragmentary data and with a skepticism born of a subjective conviction. (Ref. 2)

In the world of Science, these are serious charges. Guidon and Pessis go on to dismiss each complaint made by Meltzer et al in Ref. 1. As for the "geofact" hypothesis, Guidon and Pessis point to two of the illustrations used by Meltzer et al, remarking:

> The artefact in their figures 9 & 10 has five successive parallel flake- scars on the same edge. By the authors' hypothesis, it will have suf- fered the first when it fell; there- after, four other pebbles fell on top of it, one beside the other, regularly, eausing flake-scars with equal techni- cal characteristics.
>
> Sounds unlikely, doesn't it—even if 50,0 years are allowed. And there are over 500 such "serial accidenta."

(Ref. 1. Meltzer, D.J., et al; "On a Pleistocene Human Occupation at Pedra Furada, Brazil," Antiquity, 68:695, 1994. Ref. 2. Guidon, N., et al; "Nature and Age of the Deposits in Pedra Furada, Brazil: Reply to Meltzer, Adovasio & Dillehay," Antiquity, 70:408, 1996)

Comment. Continuing our analogy be- tween geofacts and biological organisms

(p. 27)----botl supposcdly prcduots of random processes and subsequent selec- üon —we ask how long it would take for enough random mutations to accumu- 1 -'.te, in the proper order (as with the geofact flake scars) to evolve a new species, with the help of natural selec- tion (eorresponding to Guidon et al sorting out their flaked stones)? Millions of years? But perhaps that much time was not available. See p. 141 for Ítem on the rapidly evolving eichlid fishes of Lake Victoria.

ARTIFACTS WITH AUSTRAL1AN 1NNUENDOES

ANCIENT AOSTRALIAN OVERTONES IN SOUTH AMERICA

A new BBC documentary entitled Ancient Voices proclaims that the first settlers of the New World were from Australia and Melanesia.....Evidence of early contacts comes from stone tools and charco al at Serra da Capivara, jn northeastern Brazil. These artifacts indícate human habitation as long as 50,0 years ago.

(Anⁿnymous; BBC Online Network, August 26, 1999. Cr. M. Colpitts.
For details, visit http://news.bbc.uk/ hi / english/ s ci / tech / new sid_43 0 00/ 430944.stm)

Comment. The artifacts at Serra da Capivara support the findings of N. Guidon at Pedra Furada, Brazil—also said to be about 50,000 years oíd.
(p. 27) The reference given above is not a Science journal, so caution is advised.

Farther south, in Argentina, we find still more Australian innuendoes. Sera- pers and other simple stone artifacts from Los Toldos Cave in Patagonia, dated as 12,000 years oíd, are suspici- ously similar to late-Pleistocene tools in Australia.

(Cardich, Augusto; "The First Ameri- cans: Were They Australians?" The Mam- moth Trumpet, 16:4, March 2001. Cr. C. Davant.)

EUROPE

ANCIENT ENTERTAINMENTS

Neanderthal musicmake^°, The Neander- tbals have long been portrayed as in- sensitive and brutish. But when the remains of flowers were found at Shani- dar, a Neanderthal grave site in Iraq, areheologists mellowed a bit in their assessments. Now, there is evidence th t those supposed lowbrows were also musicians. In 1996, in a Slovenian cave, researchers discovered a flute crafted from the thigh bone of a cave bear.
Stone tools of Neanderthal manufacture were found nearby. The flute is dated between 43,000 and 82,000 years oíd and is the oldest-known, deliberately manu- factured musical instrument ever found.

(Folger, Tim, and Menon, Shanti; "Strong Bones, and Thus Dim-Witted? Or Much Like Us?" Discover, 18:32, danuary 1997.)

re:-hy stale chewing gum! The journal Naturo recently printed the photograph of a tooth-marked wad of chewing gum said to be 6,500 years oíd. This particular wad carne from a Swedish bog, but similar wads have been found all over Northern Europe. Not having access to South American chicle, ancient con- fectioners made the gum from birch bark. Birch bark was also the source of the tar primitive humans used for gluing and waterproofing.

E.Aveling, University of Bradford, has concocted a fresh batch of birch- bark gum for a taste test. (No one volun- teered to try the "oíd" stuff!) She re- ported that it is neither pleasant ñor unpleasant, but neither are modern-day Moxie and Vegamite. The tooth impressions on the ancient gum wads prove that they were chewed mainly by children and teenagers---probably to annoy their parents.

(Battersby, Stephen; "Plus C'est le Meme Chews," Nature, 385:679. 1997.)

Comment. So far there is no evidence to prove that the ancient gum-makers had progressed to the more sophisticated level of bubble-gum manufacture.

A not-toa-appetizing wad of ancient birch-bark chewing gum.

MIDDLE EAST

BASÁLT SYNTHESIS INVENTED OVER 3,000 YEARS AGO!

Basalt is a blackish volcanic rock that is hard and durable. In nature it soraetimes occurs in long prisms of hexagonal cross section. In fact, ancient Micro- nesians quarried multiton basalt prisms to build their fantastic megalithic com- plex of 92 artificial islets at Nan Madol. (vol. 1, p. 19)

The inhabitants of ancient Mesopotamia had no basalt quarries at hand. Indeed, building stone of any kind was exceeding- ly scarce. What the Mesopotamians of the second century B. C. did have in abundance was alluvial silt. From this unpromising material they were able to make their pottery, writing tablets, and art objects. However, for grinding grain and engineering structures they needed something harder and stronger. Their innovative solution was: artificial basalt made from silt. They simply melted the silt and let it eool slowly.

Sounds simple, but three remarkable intellectual and teehnieal advances were required:

(1) The Mesopotamians first had to recognize that silt could be melted. This could not have been obvious in 1000 BC.

(2) Next, they had to develop high- t emper ature (1,200°C) smelters that were much larger than those they used for metallurgical purposes.

(3) Finally, they had to discover that slow cooling was needed for the growth of large crystals in the cooling melt.
(Of course, they had no microscopes to see the crystals. So, it had to have been something learned from experience.)

That the Mesopotamians were able to synthesize basalt can be seen at Mashkan-shapir about 80 kilometers south of Bagh- dad. Slabs of this artificial rock--------fíat and smooth on one side from the molds —are abundant. In fact, some 100 cubic meters of the material have been found.

(Stone, E.C., et al; "From Shifting Silt to Solid Stone: The Manufacture of Syn- thetic Basalt in Ancient Mesopotamia," Science, 280:2091, 1998. Also: Bower, B .; "Ancient Mesopotamians Made Rock from Silt," Science News, 153:407, 1998.)

Comments. In the light of the Mesopo- tamian's success in making artificial stone, perhaps we should reconsider Davidovits' claim that the ancient Egyp- tians cast some of the blocks they used to build the pyramids. In other words, they, too, made artificial stone at the sites of the pyramids. (vol. 1, pp. 12 and 13)

ₘ We can't resist remarking that the first-author's ñame jibes with the sub- ject at hand. A variety of "nominative determinism"?

AFRICA

CONFUSION THAT'S HARD TO CUT THROUGH

On p. 18, D.A. Stocks described how hls Egyptian workers were able to cut through granite with copper saws with the addition of a little abrasive sand. Sure, it was slow, hard work, but it could be done. Stocks' experimente squelehed the various speculatlons about the ancient Egyptians possessing super- hard tools or being able to soften stone.

However, C. Ginenthal writes that H. Garland and C.O. Bannister attemp- ted to saw through granite back in the 1920s using essentially the same method employed by Stocks-----but without success. Garland and Bannister wrote a book on their experimenta, from which Ginenthal has provided the following quotation:

> A consideration of the [copper and abrasive cutting] process would Beem to give support to the idea that a copper-emery [or other abrasive material] process might have been used by the first Egyptians, but the author [Garland] has proved by ex- periment the impossibility of cutting granite or diorite by any similar means to these. But the use of emery powder anointed with oil -or turpen- tine, no measurable progress could be made in the stone whilst the edge of the copper blade wore away and was rendered useless, the bottom and sides of the groove being coated with partióles of copper.

(Garland, H., and Bannister, C.O.; Ancient Egyptian Metallurgy, London, 1927, p. 95. (Cr. C. Ginenthal.)

Comment. Garland seemed wedded to emery as the abrasive. We wonder if he tried the silica sand that seemed to work for Stocks. Perhaps he did not try hard enough.

In his 2001 book Sticks, Stones, & Shadows, M. Isler mentioned Stocks' experimenta and adds that successful resulta were also obtained by R. Hopkins using Stocks' method under the auspices of the Nova/WGBH TV program "Obe- lisk" circa 1994.

SOPHISTICATED CHEMISTRY IN ANCIENT EGYPT

The ancient Egyptians applied cosmética copiously to themselves. Upper-class women (perhaps men, too) favored green, white, and black makeup. These cosmetic powders, dating from 2,000 B.C., have been exceptionally well preserved in their original vials made of alab áster, ceramic, and wood. A team of French chemists led by P. Walter was not surprised when their analyses of these powders found erushed galena and cerussite (two ores of lead). However, they nearly dropped their test tubes when they also found Chemical compounds that are extremely rare in naturej specifieally, laurionite (PbOHCl) and phosgenite ($Pb_2Cl_2CO_3$).

In fact, these compounds are so rare naturally that the Egyptian powders must be artificial. P. Walter et al wrote:

> Taken together, these results indícate that laurionite and phosgenite must have been synthesized in Ancient Egypt using wet chemistry. The Egyptians manufactured artificial lead- based compounds, and added them to the cosmetic product. The underlying Chemical reactions are simple, but the whole process, including many repetitive operations, must have been quite difficult to achieve.

It had been recognized earlier that the Egyptian chemists had used flre-based technology 500 years earlier (2,500 B.C.) to manufacture blue pigment. Wet chemistry represented another forward techno- logical step.

(Walter, P., et al; "Making Make-Up in Ancient Egypt," Nature, 397:483, 1999.)

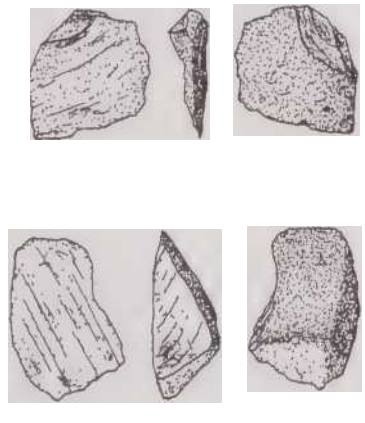
Comment. Uncowed by the successes of the ancient Egyptian chemists, those in the employ of Nissan have synthesized artificial bird droppings for use in testing automobile paints. The real stuff, you see, in inconsistent from batch to batch!

(Anonymous; "Best Automotive News," Parade Magazine, December 27, 1998. Cr. J. Cieciel)

THE PLANET OF THE APES: rrs ARCHEOLOGY

They were African and they were hungry. They searched far and wide for suitable stones and carried them to centralized sites where they used them to process food. Mostly, these stone tools were for cracking hard nuts on stone anvils. Of course, the hard pounding created some sharp stone flakes and suspicious rocky debris. Location: Tai Forest, Cote d'Ivoire, Africa.

These assemblages of tools and stone chips might be easily mistaken by amateur archeologists as being gathering places for early human hunter-gatherers.



Sharp stone flakes from a chímpanzee nut-cracking site. These could be mistaken for hominid tools by the unwary.

They would have been mietaken, because the energetic nut-crackers were modern chimpanzees.

(Vogel, Gretchen; "Can Chimps Ape Ancient Hominid Tool Makers?" Science, 296:1380, 2000. Mercader, Julio, et al; "Excavation of a Chímpanzee Stone Tool Site in the African Rainforest," Science, 296:1452, 2002.)

Comments. As a matter of fact, why wouldn't early hominid hunter-gatherers have done just what the chimps are now doing?

To an untrained eye, some of these chímpanzee artifacts (stone hammers, accidental sharp-edged stone flakes) are not all that different from those "eoliths" ("dawn-stones") sometimes presented as evidence that hominids were hunting and gathering millions of years ago (the Miocene) in Europe and even the New World.

ASIA

BLONDES IN ANCIENT CHINA

Authorities on ancient Chínese civiliza- tion have usually considered it to have been completely isolated from European influences for millennia—a homegrown culture characterized by unique cultural and technological innovations. This classical picture of ancient China will have to be modified after the recent unearth- ing of mummified Caueasians up to 4,000 years oíd in China's northwestern province of Xinjiang. These dried corpses have the long noses, deep-set eyes, and long skulls typical of Caucasiana. Some even have blonde hair! Some 113 such corpses have already been excavated at Qizilchoqa, one of four sites discovered so far. It is clear that we are dealing with permanent settlements and not merely a few lost Europeans.

> Besides the riddle of their identity, there is alBO the question of what these fair-haired people were doing in a remóte desert oasis. Probably never wealthy enough to own chari- ots, they nevertheless had wagons and well-tailored clothes. Were they mere goat and sheep .farmers? Or did they profIt from or even control pre- historic trade along the route that later became the Silk Road? If so, they probably helped spread the first wheels and certain metal-working skills into China.

V. Mair, a professor of Chínese at the University of Pennsylvania, has been spearheading the research on these mummies for the U.S. He asserts that, contrary to the general belief, there was a substantial two-way, east- west flow of ideas and inventions begin- ning at least 3,000-4,000 years ago.

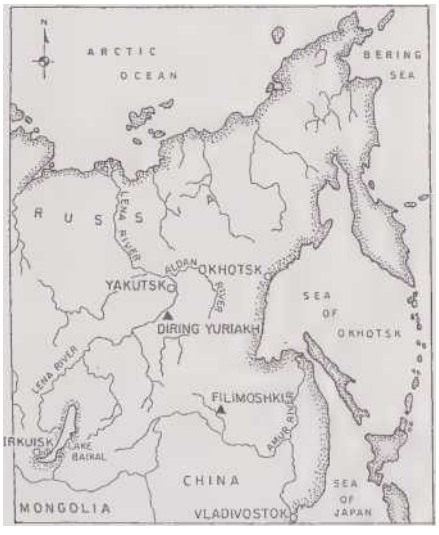
(Hadingham, Ivan; "The Mummies of Xinjiang," Discover, 15:68, April 1994.)

DID HUMANS EVOLVE IN SIBERIA?

Russian academician Yuri Mochanov thinks so! He does not dispute that humans may also have evolved in Africa and, perhaps, Southeast Asia. And he has brought back some 4,000 stone tools collected at 15 sites in the Siberian permafrost to bolster his claim that Siberia, too, was a point of origin for hominids. (See inap.)

> **Molehanov's controversia. evidence is indeed striking: a collection of chip- ped and flaked rocks that are clearly artifacts fashioned by humanlike hands and that he contends are 2.5 million years oíd—plus or minus a half-million years.**
>
> **Remarkably, that same era marked the time when early human ancestors known as Homo habilis lived and left iheir remains in the tropical Olduvai Gorge of what is now Tanzania. Moch- anov's collection of tools closely re- sembles the ones that anthropologists have long collected from digs in Africa.**

All this contrasts strongly with the dominant view of hominid evolution, which cites warm, verdant African forests and savannas as our most likely place of origin. Siberia, with its -50° winters and fleeting summers, hardly seems con- ducive to hominid speeiation. Mochanov's rationale is that this severe elimate actu- ally stimulated aneient hominids to create tools, fashion warm clothing, and build winter shelters- - -these Siberian hominids had to evolve or perish!



Eastern Russia, showing the location of the Diring Yuriákh site, where many very oíd stone tools are claimed.

In addition to the elimate factor are two other problems: (1) The Siberian sites have yielded no hominid bones ñor have animal bones of any kind been found; and (2) The dating of the tools is shaky. They cannot be radiometrically dated. Instead, Mochanov has had to rsly on the tools' similarity to African tools of 2 million years ago, magneto- stratigraphy, the decayed luminescence of the soil, and the ages of the strata in the 450-foot gorge of the Lena River. It goes without saying that other anthro- pologists are reserving judgment.

Nevertheless, Mochanov's Siberian d'scoveries have produced a magnitude-8 tremor in Science.

(Perlman, David; "Russian Scientist Says Homo Sapiens Has Arctic Origins," San Francisco Chronicle, January 17, 1994. Cr. J. Covey. A short summary of Mochanov's research appeared in: Stone,- Richard; "Turning Out-of-Africa Inside Out," Science, 262:1963, 1993.)

Comment. It is odd that some other archeological sites with apparently very aneient tools, such as that at Calicó Hills, California, are also devoid of hominid bones and radiometrically datable artifacts. A similar situation prevails at many North American epi- graphic sites, where someone wrote copiously in aneient symbols but left little else to betray their identities.

TRAVELS OF THE ANCIENT SEA RINGS

C. Hapgood (Maps of the Aneient Sea Rings), J. Bailey (Sailing to Paradise), and others have ventured that seafarers engaged in worldwide commerce perhaps years before Stonehenge and the Great Pyramid were even built. "Ridiculous," say • mainstream archeologists and anthro- pologists. "Maybe so," say some flakes of volcanic glass (obsidian) found at Bukit Tengkorak in northeastern Borneo.

This Borneo site is dated at about 4,0 BC. The obsidian flakes have been chemicaUy traced to the island of New Britain, one of the Admiralty Islands east of New Guinea, some 3,500 kilo- meter s from Bukit Tengkorak. This dis- covery impües that a long-distance trading network was in place 2,400 years earHer than previously thought.
It also suggests that seagoing vessels and navigation techniques were weH- developed at least 6,000 years ago in Australasia.

B. Bronson, curator of Asian eth- nology and archeology at Chicago's Field Museum, asserted that these simple flakes of obsidian are "going to affect our whole understanding" of the history of the western and central Pacific.

(Service, Robert F.; "Rock Chemistry Traces Aneient Traders," Science, 274: 2012, 1996.

Comment. EventuaUy it may be shown that the New World was "oíd" long before the Oíd World thought that they had discovered it.

AUSTRALIA

ARTIFACTS AT THE JINMIUM SITE. AUSTRALIA

We describe the major artifacts at the ■Tinminm site (the "circles" of contention") in some detail on p. 42. These circles are graphic in nature. However, stone tools also occur at Jinmium.

In the sedimente around Jinmium's engraved boulders, anthropologists have discovered what seem to be even-more- ancient signs of human activity: stone tools stratigraphicaHy dated at 116,000 and 176,000 years. The problem here is that most anthropologists hold (rather fervently) that modern humans did not expand out of Africa until about 100,000 years ago. Paleoanthropologist R. Rlein offered the foHowing pertinent comment:

> **If it could be demonstrated [that] people were in Australia more than 100,0 years ago, we would have to rethink everything we thought we knew about the later phases of human evolution.**

If the Jinmium dates do hold up, they would bolster the unpopular "multiregion- al" hypothesis, which holds that modern humans aróse from several protohuman populations----not just that in Africa.
The battle between the "Out of Africa" proponents and the multiregionalists has been a fierce one. The Jinmium artifacts may tilt opinión in favor of the latter. That is why this site is potentiaHy so anomalous.

But, everything hinges on accurate dating. Some of the dating has been done with a relatively new technique called "thermoluminescence" or "TL" dating. Since the Jinmium dates are wildly out of line, we may weU see some "adjustments" here.

(Holden, Constanee; "Art Stirs Uproar Down Under," Science, 274:34, 1996)

In fact, Jinmium's weU-pubhcized dates of 116,000 and 176,000 years BP for the artifacts were subjected to extreme scrutiny. Thermoluminescence (TL) dating was used in re-estimating these dates. But TL-dating is in its infaney and full of pitfaUs, so one must not accept them blindly.

Geochronologist R. Roberts has looked at the Jinmium TL data and ventures that the artifacts may be only 10,000 years oíd. However, he concurs with the TL dates of 50,000-60,000 years for two rock shelters also located in the Northern Territory.

(Gibbons, Ann; "Doubts over Spectacu- lar Dates," Science, 278:219, 1997.)

EPIGRAPHY ART

NORTH AMERICA

Symbols and inscriptions some still mysterious, others claimed to have been correctly translated--------abound in North America. They are found on isolated rocks, stone walls, and tablets that are sometimes of question- able origin. It seems that most of the controversia! (and possibly anoma- lous) epigraphic investigations have been undertaken by amateur archeo- logists and anthropologists. Therefore, one must be cautious in making too much of the claimed translations and interpretations. Some frauduient inscriptions and pictographs also bedevil researchers.

The issues of Science Frontiers between 199q and 2003 digested many articles on these subjects. These are collected and classified under the following five headings.

•A parade of curious inscriptions. When translated, most of these inscriptions suggest the Precolumbian diffusion of peoples and cultures across both the Atlantic and Pacific.

•A possible global motif. Again, worldwide diffusion is implied.

•Eccentric flints. Mayan incursions northward and trading with North American natives are ¡ndicated here.

•North American geoforms. Unlike South America's Nazca lines, the North American geoforms are generally crude and, in some cases, probably have no symbolic meaning.

•Discovery of Oíd World coins. Although only one example was found in the literature examined, this was by no means a rare event.

A PARADE OF CURIOUS INSCRIPTIONS

TRANSLATING THE GRAND. TRAVERSE STONE

The Grand Traverse Stone was plowed up about 1877 on a farm in Grand Traverse County, Michigan. A small boy following his father and plow picked it up. The stone is slate, i-inch thick, and 2i inches on each side. The symbols on the Stone are similar to those in the Pan-Mediterranean alphabet in use about the time of Christ

D. B. Buchanan, an American epi- grapher, recently undertook the task of translating the Stone. Buchanan has built up an inscription data base con- taining the variants of symbols used in the Pan-Mediterranean alphabet. He found that most of the characters on the Stone could be found in his data base. Buchanan then converted the Stone's symbols to Román equivalents and tested sound valúes in Greek and other Medi- terranean languages. He concluded that the Stone used a late form of Vulgar Latín. His transíation:

(I am) carrying (in aceounts) , 10 talents. To 10 (add) 1 voided (or useless). 1 am collecting (or sending)

The Grand Traverse stone found in Michigan. It is only about 2i inches wide.

11 only, 10 (of which) I can confírm. Transaction (is) 11 in all (or total).

The Grand Traverse Stone therefore seems to be a financial document of some kind. Buchanan dates it between 100 BC and 100 AD.

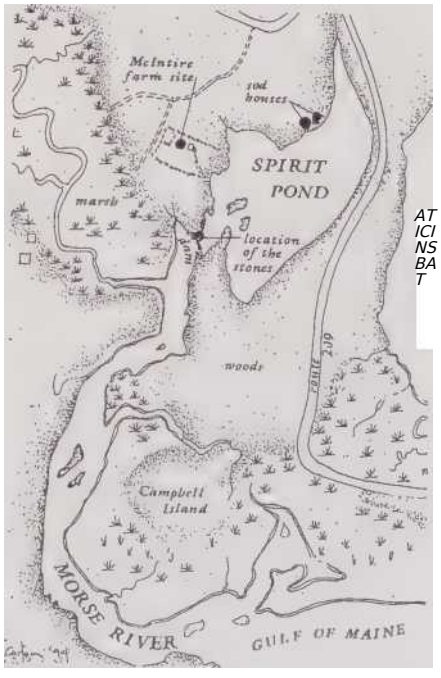
(Buchanan, Donal B.¡ "Some Remarks on an Inscribed Stone from Grand Traverse Country, Michigan," NEARA Journal, 28: 100, 1994)

Comment. The Grand Traverse Stone is just one of hundreds of tablets, coins, and inscriptions on stone walls that suggest European contacts with the New World in ancient times. Of course, main- stream archeologists dismiss all as delibérate frauds or objects imported and dropped accidentally by post-Columbian settlers. The Grand Traverse Stone sug- gesting organized trade with the New World 2,000 years ago is particularly anomalous.

THE SPIR1T POND INSCRIPTION STONE

As with the 12,000-BP barrier across the Bering Strait, establishment archeologists have erected another barrier which researchers cross at their peril. This time, the line is drawn at L'Anse aux Meadows, in Newfoundland, where a Viking presence has been officially acknowledged. Any Viking innuendoes south of this point in North America are verboten.

Nevertheless, tantalizing Viking traces are found along the New England coast and, even more anomalously, in interior North America. One of these traces is the famous and infamous Spirit Pond Insciption Stone, found in Maine.



Location of Spirit Pond, Maine. (Adapted from: S. Carlson, NEARA J,, 28:1, Summer/Fall 1993)

Egyptian meaning		*Micmac meaning*
gcodness, hcauty, truth		*holy*
heaven		*heaven*
all	A?	*full*
exaltad one		*God*

Some Micmac symbols resemble those used in ancient Egypt! Just a eoincidence? Probably!

In the latest volume of Epigraphic Society papera, Fell discusses many additional similarities between Micmac and Egyptian hieroglyphics. We have room here for only a few of the simpler comparisons. Refer to the article for a great many more—so many more that the "chance" theory seems most unlikely.

(Fell, Barry; "The Micmac Manuscripts," Epigraphic Society Occasional Papers, 21:295, 1992.)

CALIFORNIA'S MAZE STONES

Humans have been carving and drawing mazes and building labyrinths from prehistoric times. Primitive peoples laboriously carved cup-and-ring designs; newspapers today print puzzle mazes in the Sunday editions. There is something fascinating, even mystical, about mazes. They are "signs that snare men's minds."

We will never know why the Indians of Southern California lavished so much labor etching mazes on hard rock sur- faces, D.F. McCarthy, a University of California archeologist, has been studying these California maze stones for over 20 years. He has found over 50 of them so far. Some are over 3,000 years oíd, he thinks. Most are carved on rocks and boulders. They are just like our modern Sunday-paper mazes, with rectangular passageways, some blind, but always with a devious route leading to the center. Could they symbolize human life, full of potentially wrong turns, but with a Way to enlightenment?

(Hillinger, Charles; "Ancient Carvings of Indians Remain Enigma toExpert," Richmond News Leader, November 11, 1991. Cr. H.C. Nottebart.)

EARLY CHINESE VISITORS TO THE AMERICAS?

Perhaps Chinese adventurers beat the Europeans to the New World. At a symposium in Anyang, China, M. Xu Huí (Texas Christian University) pre- sented 56 matching sets of characters found in both the Americas and China.

> They so closely resemble the 3,000- year-old Shang Dynasty characters for the sun, sky, rain, water, crops, trees, and astronomy that if they had not been found in America, Chinese experts would have classified them automatically as pre-221 B.C. Chinese script.

(Rennie, David; "Carvings Link Chinese with American Indians," Chicago Sun- Times, August 31, 1999. Cr. J. Cieciel.)

THE "INSCRIBED WALL" AT CHATATA, TENNESSEE

One of our favorite anomalies over the years has been the ancient "inscribed wall" at Chatata, near Cleveland, in Bradley County, Tennessee. The above quotation marks are intended to warn the reader that said wall may not be man-made, and its inscriptions may be natural rather than artificial.

The history of the Chatata wall is long and convoluted. Discovered over a century ago, new facts are still coming to light today, as reviewed by D.E. Wirth in a recent issue of The Ancient American.

The wall was originally almost completely buried. It attracted attention only because its course was marked on the surface by stones projecting from the ground every 25-30 feet over a gent- ly curving are about 1,000 feet long.

One of these surface stones seemed to be inscribed with strange symbols. Excavations, supported at first by the Smithsonian Institution, revealed a 3- ply sandstone wall-like structure seem- ingly cemented together by a reddish mortar. Splitting the sandstone sheets- revealed diagonal rows of markings like those illustrated.

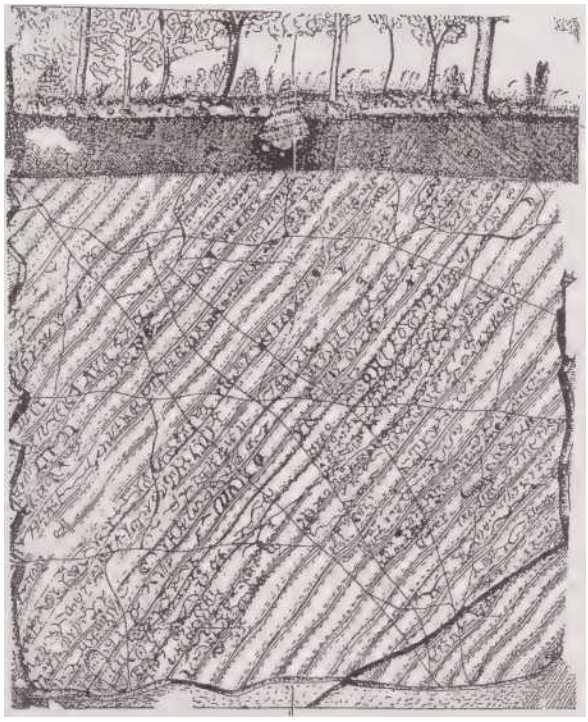
At first, both wall and inscriptions were proclaimed to be artificial. More recent studies by geologists point to natural origins for the waU, the mortar, "and even the inscriptions themselves.

The latter may be no more than the bur- rows of mollusks. This interpretation does make sense because the so-ealled inscriptions were almost completely eovered by the "mortar[1]"-----hardly a good way to convey messages! Also, the inscriptions themselves do not really look regular enough to be man-made. For these and other reasons, the Chatata wall now seems more of a geological curi- osity rather than an archeological anoma-

iy-

Nevertheless, at least two nagging questions remain:

- Why were there regularly placed stones on the surface over the waU?
- Early investigators also reported seeing inscriptions of animáis, the swastika, the serpent symbol, and other recognized Indian symbology. Whatever happened to these inscriptions?



The Chatata "wall" seems to be covered with_ma.n-ma.de symbols. Suspicious to bé'sure, but note the triangular "marker" stone protruding above the surface.

(Wirth, Diane E.; "An Ancient Wall at Chatata, Bradley County, Tennessee, Ancient American, 1:20, September/ October 1994. Also: Rawson, A.L.; "The Ancient Inscription at Chatata, Tennessee," American Antiguarían, 14: 221, 1892. Reproduced in Ancient Man.)

Comment. An incredible variety of complex markings occur on rock surfaces. Often human origina have been proelaim- ed only to yield to natural explanations. See ESX6 in Neglected Geological Anoma- ‘ lies.

A POSS1BLE GLOBAL MOTIF

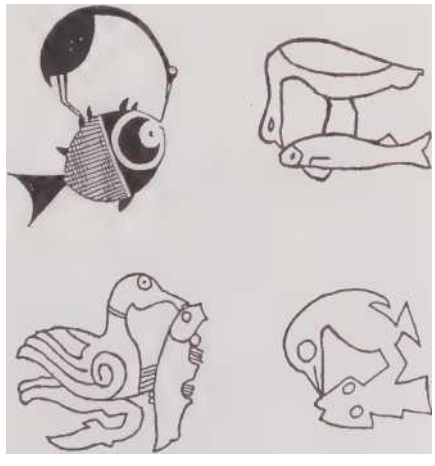
THE UBIQUITOUS BIRD-AND-FISH MOTIF

Pre-Columbiana, a relatively new avant garde archeologicaljournal, promotes the popular but "out-on-the-fringe" theory that all our planet's oceans were crossed repeatedly before Columbus (and the Vikings, too). One type of evidence adduced to prove such Precolumbian cultural diffusión is the widespread appearance of motifs that are so specific and unusual that one is forced to admit that independent invention seems very unlikely. .

In the latest issue of Pre-Columbiana, G. Farley has colleeted examples of the singular "bird-and-fish" motif from Asia, Africa, both Americas, and the Middle East. As you can see from the illustra- tions, the similarities are striking, and the bird-fish "contact" highly specific.

(Farley, Gloria; "World-Wide Occurrence of a Bird-and-Fish Motif," Pre-Columbi- ana, 1:187, 1999.)

Comment. Yes, we do know that the birds involved are all fish-eaters, but the "kisses" seem more symbolic than pre- consumption. Also, the fish por- trayed are often too big to swallow.



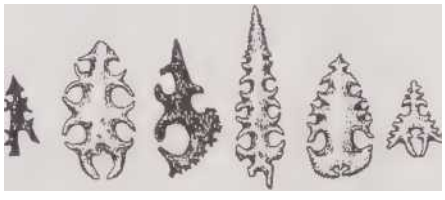
Bird-and-fish motifs. Clockwíse from upper left: Mimbres culture, New México; ancient Egyptian hieroglyph; Chimu culture, Perú; ancient China.

ECCENTRIC FLINTS

QKLAHOMA'S ORNATE FLINTS: "ECCENTRIC" OR FRADDÜLENT?

The ñrst of the accompanying illustra- tlons shows some of the órnate flints dug up in Delaware County, Oklahoma-, in 1921 by M. Tussinger. The second picture is of a genuine Mayan "eccentric" flint frora Quirigua, Guatemala. These exquisite examples of flint knapping evoke two questions: (1) Why bother turning out these highly labor-intensive objects by the thousands? (2) What are typically Mayan artifacts doing so far north in Oklahoma?

Many of the flints, whether from Mayan sites or Oklahoma, are incredibly complex. Some are up to 20 inches in length. Countless hours must have been invested in delicately chipping away at flint blanks. Apparently, órnate flints were an art form of great importance to the Maya. They are found in lar ge num- bers in the burials of important person- ages. Archeologists too often explain puzzling artifacts by saying they had "ritual valué." But, this answer may be correct here. Mayan eccentric flints are probably the equivalente of Christian stained-glass Windows and elaborately illuminated manuscripts. The less "prac- tical" they are, the higher their ritual valué 1 .



Typicál "eccentric" flints from Oklahoma.

Purpose aside, did Mayan influence and trade really reach far north into Oklahoma? Many archeologists doubted this at first. They claiméd that Tussinger knapped the Oklahoma flints himself and sold them during the Depression for a dollar or so apiece. But how would a simple, uneducated, Oklahoma farmer know about ancient Mayan flint making? Furthermore, Tussinger claims he found some 3,500 of these remarkable objects in a single cache while exploring a mound. That's a lot of flint knapping for one person! (Actually, many very large caches of flints, both practical and "eccentric," have been unearthed in North America.) More recently, the possibility of fraud has diminished with the dis- covery of similar órnate flints elsewhere in Oklahoma. In 1961, C. Murray found a small cache of 107 flints similar to Tussinger's in the same Oklahoma county.

(Iler, Jim; "Oklahoma's Buried Maya Treasure," Ancient American, no. 13, p. 3, 1996)

Comment. The message of the eccentric flints xs that Mayan influence probably did reach far into North America and very likely influenced the Moundbuilders —perhaps even in the design of their temple mounds.

SCULPTED HEÁDS OF CONTENTION

THAT LITTLE "ROMAN" HEAD FROM PRECOLUMBIAN MEXICO

The miniature clay head illustrated below was discovered in 1933 in a burial offer- ing in the archeological zone of Tecaxic-Calixtlahuaja, México. The burial has been dated as from the 12th-13th centuries AD. The features of this little head can hardly be described as typical of Precolumbian Mexicans. In fact, it is often termed a "Román" head. But is it really? And how did it get into a Pre- . columbian burial site?

This miniature clay head possesses Román features and style, but it was recovered from a Precolumbian Mexican burial. Length: about 2¿ centimeters.

Theory #1. Some Mexican archeologists insist it is a post-Columbian artifact that somehow "filtered" down into a Pre-columbian site. Given that the head was retrieved from beneath three floors of stone and Indian cement, this theory seems questionable.

Theory #2. The head is truly of Román origin and was transported to Precolumbian México from Southeast Asia by Chínese or Hindú voyagers.

Theory 3. The author of the present article, R.H. Hristov, favors a Viking origin. The cap on the head and even the physiognomy have Norse overtones. The ehronology is right, too, for the Vikings were exploring North America's east coast in the llth century. Did they venture as far south as México? Hristov points out:

> **It is well known that in this area very significant political-cultural perturbations occurred among the autochthonous civilizations between the lüth and 13th centuries AD.**
> **These were produced by a small group of white immigrants with beards who carne from the Atlantic Oeean.**

Some ground figures and rock align- ments from California[1] s Panamint Valley.

(Hristov, Romeo H.; "The Little 'Román' Head of Calixtlahuaja, México: Some Re- flections," NEARA Journal, 28:68, 1994. NEARA = New England Antiquities Research Association)

Comment. This little "Román" head should be related to the supposed Román coin (p. 34) and the possible Román masons' symbols on the bricks at Comalcalco (p. 35).

HEADS DOWN!

S. Breiner wields a magnetometer when he searches for Olmec artifacts. This instrument allows him to detect buried objects, and he has made some surprising discoveries.

The Olmecs flourished circa 1,500-400 B C, in Mexican States of Vera Cruz, Oaxaca, and surrounding areas. This enigmatic culture is probably best known foi the giant stone heads they carved out of hard rock. These massive heads, 8-15 feet high, seem to display African fea- tures. Breiner has found two of the 17 known heads. The most interesting one welghed 10 tons and was buried 18 feet deep! Why would a thriving culture bury the product of so much intensive labor?

One of the giant Olmec stone heads from México. This one has been designated "San Lorenzo I." The head mentioned in the digest was similar, weighed 10 tons, and was buried 13 feet deep.

(Robinson. Dave; NEARA Transit, 11:12, Spring equinox 1999. Item attributed to New York Times, May 26, 1998.)

Comment. The burial of the Olmec head might have had ritual significance, like the ritual smashing of pottery or the sacrificing of animáis. Be this as it may, we wish to connect the Olmec heads with the large stone spheres found in Costa Rica, just a few hundred miles down the Pacific Coast. The Costa Rican spheres are also beautifully and laboriously crafted from hard rock. Many are several feet in diameter. The eurious part is that many of them were also buried in the jun- gle soil like the Olmec heads. They were exhumed only when banana plantations were established (vol. 1, p. 8)

A CLOSE LOOR AT A CRYSTAL SKOLL

The crystal skull deposited in the Bri- tish Museum, like most of the other crystal skulls discovered in Mesoamerica, is considered a first-class anomaly. This compelling artifact is carved out of hard crystalline quartz. It is said to exert an eerie effect on its viewers. Some say it was carved by the Atlanteans, but the Azteca are generally credited with this amazing job of manufacture. The big puzzle is: How could the Aztecs have done it without modern lapidary tools— the skull is so smooth and perfect? Well, maybe the Aztecs didn't carve it!

A. Rankin, of Kingston University, has examined the tiny trails made by fluid inclusions in the quartz matrix. He finds that they are characteristic of Brazilian quartz. In fact, there seem to be no suitable sources of massive quartz crystals anywhere in México; and the Aztecs do not appear to have made any incursions into Brazil.

Even worse, British Museum experts have now found small cuts made by steel tools on the insides of the teeth. The skull, they suggest, is actually modern and carved with a jeweler's wheel.

(Hawkes, Nigel; "Famous Aztec Skull Is Thought to Be a Fake," London Times, September 30, 1995. Cr. A.C.A. Silk)

OSIRIS ISIS

The se Egyptian-style statuettes come from Precolumbian Mayan ruins in México.

ANCIENT EGYPTIANS IN THE NEW WORLD?

In issue #8 of The Ancient American, G. Thompson translated a few para- graphs from Mariano Cuevas' 1940 book: Historia de la Nación Mexicana. We now summarize that translation.

In August 1914, Professor M.A. Gon- zales was excavating Mayan ruins in the city of Acajutla, in México. The two illustrated statuettes were uncovered. On the male, the headdress, the beard, and the cartouche are all typically Egyp- tian in style. The male is thought to represent Osiris, the female Isis.

(Thompson, Gunnar; "Egyptian Statuettes in México," Ancient American, 2:12, no. 8, 1995.

In the same issue of The Ancient American, the issue of whether the ancient Egyptians reached the New World is joined with pro and con articles. The first is entitled: "The Egyptians Were Here!" It is written by R.A. Jai- razbhoy, like G. Thompson an ardent diffusionist and author of the recent book Rameses III: Father of Ancient America. No need to ask what Jairaz- bhoy's position is on the issue!

The second article is a rebuttal to the whole Egypt-in-America business by E. Lurio. His title: "Point: No Egyptians in Ancient America." Lurio is also the author of the 1990 book: A Fractured History of the Discovery of America. Lurio eoncludes: "Sorry folks! It Just ain't so."

Finally, G. Thompson comes to the fore again with: "Counter Point: Egypt's Role in Ancient America." Thompson's latest contribution to the anomalist's librar y is: American Discovery.

We have to warn readers that the magazine issue under scrutiny may con- tain fraudulent material and wishful correlations on one hand and, on the other hand, by uncalled-for, derisive dismissals of artifacts and epigraphy that really may be legitímate. Great care is advised.

INSCRIPTIONS OF CONTENTION

DID CAPTIVE CHRISTIANS AND MOSLEMS BÜILD THIS MAYAN PYRAMID?

The cover of the 1993 volume of Epi- graphic Society Occasional Papers presente a color photograph of a Mayan stepped pyramid at Comalcalco, Tobasco, México. This pyramid, which is also known as Temple 1, is constructed of fired bricks. The pyramid and bricks are not anomalous, but the graffíti in- scribed on thousands of the bricks is, for it is typical of Román North Africa. Punic, Libyan, and Arabic scripts are represented. Barry Fell suggests that the temple was constructed by Christians and Moslems captured by the Mayans long before Columbus ventured west- ward into the Atlantic.

(Fell, Barry; Epigraphic Society, Occasional Papers, 22:57 and cover, 1993.)

THE INSCRIBED BRICKS OF COMALCALCO

Comalcalco is a Mayan site in Tabasco, southeastern México. It is unusual as Mayan sites go because its 375 struc- tures, including a large stepped pyramid, incorpórate millions of fired bricks. Many of said bricks, when separated

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The illustrated bricks of Comalcslco are pieces to a grand puzzle, whose completed, final image may reveal a Román Christian presence in the Americas a thousand years before the arrival of Columbus.

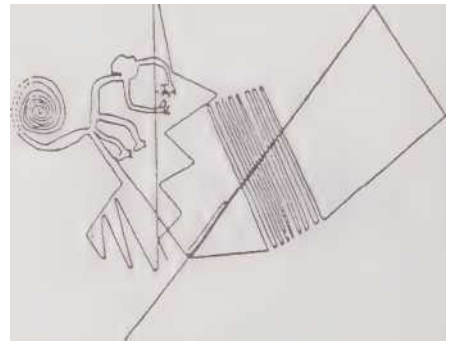
(Steede. Neil; "The Bricks of Comal- calco," Ancient American, 1:8, Septem- ber/October 1994. Fell, Barry; "The Comalcalco Bricks: Part 1, the Román Phase," Occasional Papers, Epigraphic Society, 19:299, 1990)

THE NAZCA UNES AND OTHER GEOFORMS

WATER SIGNPOSTS, RITUAL PATHS

The high, deslóate, and sere plains of western South America are an ideal médium upon which to inscribe immense pictographs. Die-straight lines several miles long and a few yards wide were made centuries ago on Peru's Nazca ^ Plain by simply removing off to the side the rocky veneer of the plain's surface. Less than an inch of rain falls each year there----not enough to wash out of word of what was written 2,000 years ago.

Actually, no words as such are in- scribed, rather there are huge biomorphs (for example, a pelican 1,000 feet long) and geoglyphs (a trapezoid enclosing 160,0 square yards). Overlaying and mingling with these pictographs is an apparent hodgepodge of hundreds of straight lines, one of which is 9 miles long. It is a confusing canvas to say the least.



A Nazca geomorph (monkey -with a spiral tail) overlain by another abstract, hard- to- interpret geoglyph. Additional illus- trations of the lines in vol. 1, pp. 38 and 39.

This gigantic terrestrial easel covers 400 square miles. Upon it are drawn more than 1,000 biomorphs and geoglyphs, plus some 800 straight lines. It is one of the World's great archeological legacies from the deep past.

Actually, at least two canvasses seem to be superimposed. The earliest canvas consists of the geoglyphs, which were incised beginning about 200 B.C. Peel away these, and we are left with the geometrical figures and straight lines. these seem to have been inscribed star- ting about 600 A.D.------a time of severe drought, which may be a clue to their purpose.

Next, strip off the geoglyphs (trape- zoids and such), and a seeming mishmash of straight lines survives. But most are not random when analyzed. Most converge spoke-like upon 62 or more "ray centers."

Thus, the Nazca Plain seems to be a 3- page book: biomorphs, geoglyphs, and spoked ray-centers. They all overlap. It's all a gigantic Rorschach test; and different observers see different things!

Of course, there are doodles on

(Top) Some typical masons's signs seen on germine Roman-ma.de hricks. (Bottom) Suspiciousiy similar masons's signs on hricks at the Precolumbian Comalcalco cite in México.

frnm their mortar, display various sym- bols as well as their makers' finger- prints. N. Steede collected a "small" sample of these bricks (4612 hricks weighing in at 21 tons) and photo- graphed the inseriptions that decorated some 1,500 of them. Many bear what are interpreted as "masons[1] signs". These turn out to be virtually identical to those found on Román bricks in the Oíd World. N. Steed concluded:

MORE EVIDENCE FOR PRECOLUMBIAN CONTACTS FROM ASIA

The following news Ítem appeared in the NEARA Transit: *2

Dr. George Cárter excitedly reported news of a possible breakthrough in Asian/pre-Columbian contact. Dr. H.M.. Xu is a Chínese scholar teach- ing linguisties at the Central Okla- homa State University at Enid, OK. There is a small publication repor- ting Dr. Xu's ability to read some Chínese characters plainly visible on several ceremonial jade adzes from La Venta, México. The dates would be about 1100 B.C., relating well to the beginning of the Olmecs.

(Anonymous; NEARA Transit, 8:7, no. 2, September 1996) NEARA = New Eng- land Antiquities Research Association.

Comment. This is a first-class anomaly because mainstream archeologists wince visibly at the mention of ancient Chínese visits to the New World. Hopefully, de- tails wül be forthcoming.

SOUTH AMERICA

Still mysterious as to their purpose, even after decades of archeologica] research, are the famed Nazca Lines of Perú. These many-mile-long lines belong to the more general category of "geoglyphs," those giant symbols and designs engraved or somehow impressed upon the earth's fabric. We mention below, for example, the curious "Candelbra of the Andes."

While not unique to South America, the use of knotted strings to record and store information reached its apex of sophistication among the Incas. The Inca knotted strings have been named "quipus." Some of the quipus have been translated but others remain anomalous.

^e. divide **the South American "graphic artifacts" recorded in the 19932004 issues of Science Frontiers into the following four categories.**

- The Nazca Lines and Other Geoforms.
- The Quipus.
- Puzzling Paintings and Inseriptions. More Australian innuendoes.
- An Anomalouslv Early Map of South America.

this 400-square-mile canvas that don't fit on any of the three pages. We'll have to ignore them for now.

The archeoastronomers first tried to read something meaningful into the Nazca lines, but they were disappointed. Computer analyses revealed no signifícant connections with the rising and settings of heavenly bodies. Next, some tried to relate the biomorphs to the celestial sphere. Did a terrestrial bird figure point toward a bird-like grouping of stars? A few earth-sky bird connections are interesting in this regard, but generally the idea that the Nazca lines are a terrestrial zodiac has not panned out well.

The geo-speculators have had more success. There are many "water" con- neetions.

- •The geoglyphs were drawn at the time of a great drought.
- •The geoglyphs are often colocated with groups of subterranean aque- ducts called "puquios," which were constructed during the drought.
- •The "ray centers" are usually loca- ted near water sources.
- •The trapezoids are generally oriented parallel to the flow of surface water.
- •Seashells and ceremonial drinking vessels have been excavated near the trapezoids, suggesting water- connected rituals.
- •Fossil footpaths follow many of the Nazca lines.

Accumulating evidence has led many archeologists and anthropologists to eon- clude that some of the Nazca lines are ritual pathways, meant to be walked rpon and to lead processions to spots where prayers for more water would be most effective.

The geoglyphs, however, remain mysterious.

(McClintock, Jack; "The Nasca Lines Solution," Discover, 21:74, December 2000.)

Comments. The Nazca lines have not been neglected in past newsletters. See vol.l, pp. 34 and 35.

Ritual processions like those hypothe- sized for the Nazca Plain resemble those thought to have taken place along Ave- bury's avenue, Carnac's stone rows, and Chaco Canyon's mysterious converging system of "roads." Ritual processions seem to be built into the human genome.

A NAZCA ZODIAC?

Although the famous Nazca lines and figures etched into Peru's Atacama Desert are assuredly not part of an. ex- traterrestrial landing field, they stUl may have a stellar connection of sorts. p.B. Pitluga, of Chicago's Adler Plane- tarium, proposes that some of the figuies may be part of a Zodiac; that ís, a terrestrial representation of the constellations. Here follows an abstract of her paper presented before a meeting of the Society for Scientific Exploration.

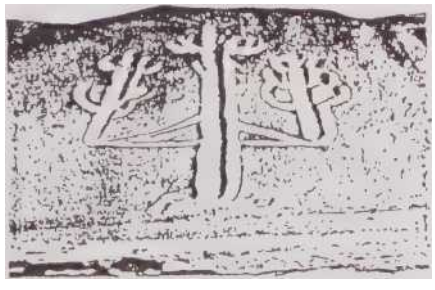
> New field measurements and Computer analysis link the gigantic ground drawings to the Andean tradition of dividing up space and time by cycles of the Milky Way. By including ethno- astronomy in the analysis, these con- clusions differ írom [those of] pre- vious researchers. The first hypothe- sis tested was that the figures could be considered like labels to the lines. Of the twenty-seven figures, ten are birds, three are whales, and two are seaweed plants. Theodolite measurements revealed a non-random distribu- tion of the directions of lines attached to look-alike figures. The second test showed a physical relationship of pre- sent-day Andean plant and animal figures imagined as silhouettes in dark spots along the Milky Way to figure-lines pointing to the rising and/or setting of the same Andean figure 2000 years ago. In the third test, all other lines ext^nding to the desert horizon from a figure center keyed into dark spots and bright stars along the Milky Way at the same Local Sidereal Time in the same year. Finally, the directions of the long axis of each quadrangle related to the same sky in the same year at each site. Linking these findings with what is known about the Nazca culture, an agricultural-ceremonial model is- presented describing how this site may have been used.

(Pitluga, Phyllis Burton; The Explorer, 12:1, Summer 1996. The Explorer is a newsletter published by the Society for Scientific Exploration.

Comment. Probably the best-known ter- restrial Zodiac is that alleged to be com- posed of natural and artificial land forms in the vicinity of Glastonbury, England. See also p. 15 for the "Pit Zodiacs" said to be arrayed in the environs of Muggenberg, Netherlands.

THE CANDELABRA OF THE ANDES

One of the most engimatic giant ground drawings (or "geoglyphs") in South America is seen best from several miles out at sea. Etched into a sloping hill at Pisco Bay on the Peruvian coast, this strange figure looks vaguely like a can- dlestick; thus, its ñame "The Candelabra of the Andes." The Candelabra is 595 feet long and can be seen from as far as 12 miles out to sea. Pottery found near the figure has been carbon-dated at 200 BC and is assignable to the ParacaB Culture. Separated by 130 miles from the Nazca Plain, with its famed giant figures, the Candelabra apparently is not the work of the Nazca people. It is puzzling why that such a figure would be placed where it could be seen best by sailors. As with Costa Rica's stone spheres, the Candelabra's makers, purpose, and symbology are in doubt.



The Candelabra measures 595 feet from top to bottom and is visible from far out at sea. What was the purpose of this strange geoglyph?

The Pisco geoglyph really doesn't match the motifs in our books on South American archeology. Some archeologists say it is only a trident, but who ever saw a trident like this? F. Joseph, the author of the present article, thinks it looks like a Jimson weed! Furthermore, he states that there is a miniature versión of the Candelabra drawn on a rock in California's Cleveland National Forest. Joseph associates the two candelabras in this way: The ancient inhabitants of Perú voyaged to California to collect Jimson weed and other hallucinatory drugs. When they sailed back to Perú with their cargo, they used the Pisco geoglyph as a navigational aid!

(Joseph, Frank; "The Candelabra of the Andes," The Ancient American, 2:10, no. 10, 1995.)

QUIPUS

STRINGWARE

Incan quipus often look a bit like the working end of a color ful dust mop. Who would imagine that these apparently hopeless tangles of knotted strings are really complex and sophisticated data bases. Further, as capaeious information storage systems, quipus far surpass cuneiform tablee, Egyptian hieroglyphics, and other ancient symbolic recording systems.

Many Incan quipus have been de- stroyed since the Conquest. Only about 600 are left for us to study. Some stu- dents of quipus are satisfied that the clumps of knotted strings are nothing more than mnemonic devices; that is, only memory aids. This seems to be a simplistic view. Whereas most writing systems are inscribed on two-dimensional surfaces, quipus:

> are three-dimensional arrays of knots. They consist of a primary cord, usually 0.5 to 0.7 centimeters in dia- meter.to which are tied thinner "pen- dant" strings—typically more than 100 and on occasion as many as 1500. The pendant strings,' which sometimes have subsidiary strings attached, bear clusters of knots.

The records of the Spanish conquista- dors tell how the Incan "knot-keepers" —the "khipukamayuq"—"read" the quipus by first visually inspecting them and then parsing them with their fingere Braille-style. These actions were accom- panied by the manipulation of stones. So, sometimes at least, the knotted strings involved a supporting set of manipulat- able objects of unknown purpose. Hardly a simple data base.

However, most of the surviving quipus do seem to be merely number- storage devices.The lowest knot in a string representing 1, with the knot's decimal valué increasing upward. lOOs and l,000s, etc. were coded separately.

fe

Incan quipus enended information in variable knot types, string colors, st'áng plies, and even types of fiber.

Most interesting is the 20% of the quipus that are labelled "anoraalous." According to some investigators, these incorpórate a "semasiographic" form of writing that was not linked to the spo- ken language; that is, it was more like musical or dance notation.

While the English language possesses only 26 letters and computers converse ?n binary (only ls and Os), quipus use many more "degrees of freedom"; for example, color-coding (24 distinct colors recognized), many types of knots, plus coding via different types of spinning and plying. Even the variety of fiber (cotton or wool) possessed information valué.

Unfortunately, anthropogists have no Rosetta stone to help them transíate the "anomalous" quipus, ñor did the Spanish record any quipu readings they coaxed from the khipukamavuq.

Scientists have wondered why a civili- zation as advanced as that of the Inca had no writing system. Apparently, they did, but it is not engraved on tablets. Further, it is highly abstract, written in many dimensions, and unrelated to the language used by the common people.

(Mann, Charles C.; "Cracking the Khipu Code," Science, 300:1650, 2003.)

Comment. Curiously, the Inca adopted a form of data recording radically different from that the earlier Maya culture's glyphs —about which they must have known!

The number-oriented quipus were obviously not designed for rapid calcu- lations. For such, the Inca employed "calculating tables." (See: Glynn, W.B.; "La Yupana ou Table de Calcul des Incas," Kadath, #47, p. 16, Autumn 1982.)

PUZZLING PAINTINGS AND INSCRIPTIONS

TRACES OF THE SOUTHERN FLOTILLA

Decades ago, G. Cárter reminisces, he found in the Johns Hopkins library a book entitled: Deutsches Verein fur Wissenschaft zu Santiago Chile. In it was an article by a Germán who had taken refuge from a storm in a Chilean cave. There, he had found a mysterious inscription which he duly copied with Germán meticulousness. Cárter later sent the inscription to B. Fell who trans- lated it as follows:

> This is the Southern boundary of the long dry mountainous land that the admiral claims for the Pharaoh, his gracious queen and noble son—, signed Maury, the navigator, in charge of the Southern flotilla.

(Cárter, George F.¡ "An Eclectic View," NEARA Journal, 28:83, Winter/Spring 1994)

Comment. In several preceding Ítems, we see Precolumbian America being in- fluenced from both east and west. We say "west" because many clues are strewn across the Pacific indicating an ancient Egyptian- sponsored expedition, manned by Libyans, probing the New World long before the Comalcalco bricks were fired. **(See p. 35)**

ANOMALOUS SOUTH AMERICAN CAVE PAINTINGS

At Los Toldos and especially another Patagonian site called Estancia La María, there is distinctive artwork virtually identical to some from Australia. Specifi- eally, this artwork consists of "hand negatives" (silhouettes of the artists' hands) and spiral and circular drawings composed of little spots. (Ref. 1)

Additionally, a remarkable and entire- ly distinct form of Austr alian art------the famous Bradshaw paintings—are strange- ly echoed in the artwork of the Paracus Culture of Perú. (Ref. 2)

It is relevant in the above context that one of the Bradshaw paintings de- piets a boat with upright prow and stern and which is manned by many pad- dlers. The Bradshaw people obviously were familiar with the sea.

No one seems to know when the Brad- shaw Culture flourished in Australia or where it carne from. It disappeared sud- denly, leaving behind perhaps 100,000 Bradshaw "art galleries" decorating rock overhangs along Austr alian rivers. (Ref. 2)

(Ref1. Cardich, Augusto; "The First Americans: Were They Australians?" The Mammoth Trumpet, 16:4, March 2001. Cr. C. Davant. Ref. 2. Coukell, Alian; "Spellbound," New Scientist, p. 34, May 19, 2001)

Comments ■ We briefly discuss Austra- lia's "mystery race" that was supposedly responsible for the highly anomalous Bradshaw paintings on p. 43.

An early Austr alian cultural beach- head in South America is, of course, relevant to the burgeoning "diffusion" xssue that permeates this chapter.

AN ANOMALOUSLY EARLY MAP OF SOUTH AMERICA

WHO FIRST MAPPED THE WEST COAST OF SOUTH AMERICA?

It seems apparent that some explorer had seen Cape Horn before Magellan made his round-the-world trip in 15191522. This has been deduced from an extraordinary world map drawn in 1507 in France. This map, called the Wald- seemuller Map, depiets surprisingly ac- curately Central and South America. Of course, the Atlantic coast of the New World had already been mapped by Euro- peans, but standard history insists that Magellan was the first European to fight his way around stormy Cape Horn to the Pacific shores of South America. In op- position to standard theory, the Wald- seemuller Map shows clearly the bulge projected out into the Pacific where Perú meets Chile. A smaller map also made in 1507 by the Waldseemuller team faithfully depiets Cape Horn.

Well then, whence this precocious geographical knowledge?

One theory has the Portugese, then intensely competing with Spain for world hegemony, sponsored a secret expedition in 1500 that fought its way around Cape Horn and sailed north up South America's western coast.

A second possibility deviates even further from accepted European theory. It asserts that the anomalous information obvious in the Waldseemuller Map was derived from a Chínese expedition mounted by Chinese Admiral Zheng that crossed the Pacific between 1421-1423. Zheng is even said to have entered Carib- bean waters 71 years before Columbus!

(Gugliotta, Guy; "A New Theory on Map- ping the World," washingtonpost.com, October 7, 2002. Cr. H.H. Henry.)

EUROPE

Many European caves are justly famous for their Ice Age artwork. But some of this artistry transcends esthetics and is, in addition, related to the acoustical properties of caves and, in a few cases, to zodiacal representations of the heavens outside.

One European epigraphic anomaly is much more recent. We refer to the seemingly untranslatable Voynich Manuscript with its accompanying exceedingly strange drawings.

Our 1993-2004 collection of European graphic anomalies is split into three categories.

•Remarkable Cave Art and Related Acoustics.

•The Voynich lVianuscript.

•Coin Maps, Grooyed Bones, and Miscellany. Included is a claimed turkey that cannot be found.

REMARKABLE CAVE ART AND RELATED ACOUSTICS

INCROYABLE?

"Incredible?" Yes, if what paleoastrono- er C. Jegues-Wolkiewiez claims is borne out by further study. The venue here is the Lascaux Cave in France where, some 17,000 years ago, Cro-Magnon artists drew incredibly expressive por- traits of animáis in the glare of torches. Its is in this eave's dark recesses that Jegues-Wolkiewiez sees two phenomena that could overturn our view of the Cro-Magnon culture.

First, he claims that some of the animal paintings are really based upon star confígurations. In effect, humans 17,000 years ago were constructing a zodiac of sorts. This was about 10,000 years be- for the ancient Babylonians laid out their first zodiacs.

For example, Jegues-Wolkiewiez as- serts that the painting of a bull in Lascaux is drawn and positioned such that it mirrors a group of stars in the constellation Scorpio. He identifies several other like "congruences." Cro- Magnons, it seems, were astute obser- vers of the heavens and attempted to make some sense out of the star con- figurations they saw.

The second claim of Jegues-Wolkiewiez notes that on the summer solstice the last rays of the setting sun penétrate the cave and illuminate a bison painted in red. He believes this is no accident, and that, 17,000 years ago, humans already appreciated the changing length of the days and the seasonal movements of the sun. This is precocious astronomy by any measure.

(Lima, Pedro; "L'Incroyable Decouverte d'une Paleo-Astronome," Science et Vie, p. 77, December 2000. Cr. C. Maugé.)

Comments. C. Jegues-Wolkiewiez is iden- tified as an "independent" paleoastrono- mer," which seems to mean that he is not part of the French scientiñc estab- lishment.

It should be remarked that about 5,0 years ago, the New Grange passage grave in Ireland was constructed with a special channel to admit light to the central chamber only at sunrise on the year's two equinoxes. A stone chamber in the Gungywamp Complex, in Connecti- cut, possesses a similar light channel. (See p. 2.) Evidently human minds far- separated in time and geography have similar ideas.

Conceptual drawing of a Cro-Magnon artist painting a zodiac figure upon a cave ceiling. His assistant holds a star map to guide him.

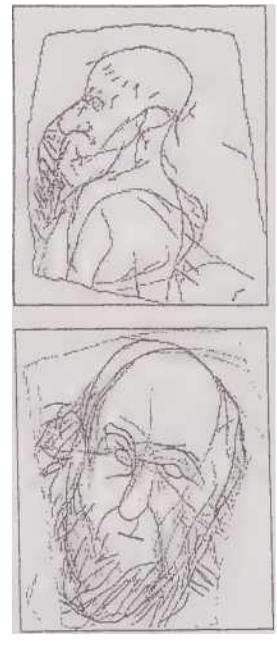
ICE-AGE FACES ON CAVE FLOORS

The stunning, life-like pictures of animáis painted on the walls of Lascaux and other French caves reveal the artistic talents of humans circa 17,000+ years ago. However, it has always been a puzzle why such accomplished artists drew such crude, sometimes stick-like, human figures amid the elegantly and realisti- cally drawn fauna.

Perhaps the archeologists who first explored these caves were distracted by the galleries along the cave walls and did not appreciate that they were walking over a radically different and scientifi- cally significant art form on the cave floors—a form of art depicting realisti- cally drawn people with faces like ours, men and women bearing facial expressions we see everyday, and characteristics of a culture that dressed rather stylishly in robes, hats, and boots quite unlike the mind's picture of those "cavemen" we learned about in our childhood.

Actually, the existence of these eave-floor images was recognized 50 years ago, but their authenticity was questioned. The cave explorers couldn't take their eyes off those animáis on the walls.

Beginning in 1937, a French scientist, L. Pencard, began a 5-year exploration of a system of caves at La Marche, France, but he looked looked floor-ward instead of wall-ward. In the eave's lengthy dark environs, Pencard found over 1,500 engraved limestone slabs laid out along the cave floors. The etched (not painted) slabs were about 15,000 years oíd. Like the Lascaux walls, they depicted lions, bears, and horses, but also 155 very lifelike human figures, such as reprodueed here.



This artwork shows humans as they lived 10,000 years before the Egyptian pyramids were raised; humans who were alive even as Europe was in the grip of the Ice Ages.

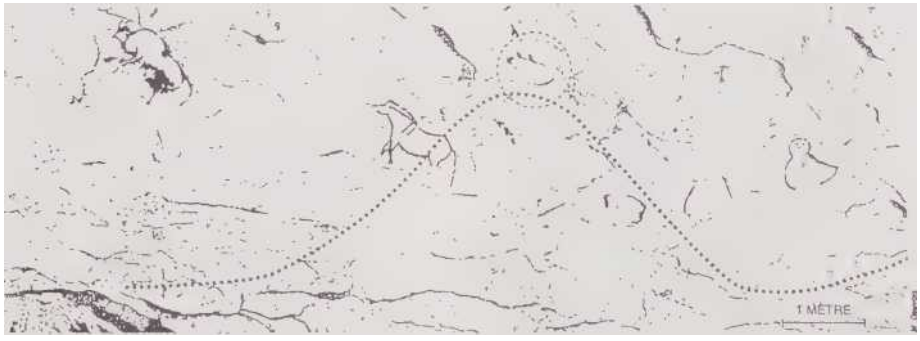
(Whitehouse, David; "Faces from the Ice Age," BBC News Onüne, May 28, 2002.)

Comment. Why was such realistic and evocative art consigned to cave floors?

CAVES AS MUSICAL INSTRUMENTS

In vol 1, p. 43, we reported how some aneient rock art was apparently intention- ally painted on rock faces so that echos, as from a handclap, would not only be unusually loud but have some relation to the painting, as in the clatter of hooves.
In a similar vein, some man-made chambers, such as New Grange (3,500 B.C.) were configured to enhance the subjective effects of ritual ehanting. (p, 19)

A fascinating article in Pour la Science, has described how ancient paintings in some of Europe's famous decorated caves were placed where sound resonated. To illustrate, examine the accompanying illus- tration of the north wall of the Jeannel Gallery of Portel Cave, in Arlege. The long, looping dotted line in dicates the amplitude of resonating sound at a fre- quency of 95 Hertz, as the long gallery behaves like a giant wind instrument. The peak occurs smaek in the center of the decorated area. At the peak, in the dotted circle, there is a rocky projection in the shape of a (hard-to-see) feline head.
On the opposite wall (not shown), the same peak coincides with an ocher circle that dominates a meter-long decorated panel.



North wall of La Galerie Jeannel. The dotted curve indicates the standing-wave amplitude of a 95-hertz sound.

(Dauvois, Michael, et al; "Son et Musique au Paleolithique," Pour la Science, p. 52, no 253, November 1998. Cr. C. Maugé.)

Comment. Modern humans are also cogni- zant of acoustieal effects, as in the de- sign of auditoriums, churches, whispering galleries, etc.

plantʳ;, actronomical maps, and even crude human figures. Then, there's the' boldly written script that annotates the drawings----copiously on occasion. Super- ficially the Voynich Manuseript looks like a medieval herbarium combined with an astronomer's musings.

The words look as if you could read them easily, but you cannot. No one has been able to, except for the interpreta- tion of a few plant labels. The words represent no known language, yet sta- tistical tests eonfirm that a real language was used. "Real" but uncrackable after much labor by leading cryptographers.

The plants look like species you might find in your backyard and nearby fields. Botanists, though, assure us that most do not exist in nature. The copious plant labels in that unreadable language are of no help.

Astronomical drawings and zodiacs fill some pages. Hope rises when we see a zodiac beginning with Pisces but fades when Scorpius turns out to be a lizard. Cáncer is represented by two lobsters; Gemini by a man and woman.

Superficially, the manuseript seems so readable and comprehensible, but its meaning forever slips away like the grin on the Cheshire cat. One student of the Voynich Manuseript, Rene Zandbergen, ventures that the problem goes beyond hidden codes and messages; i.e., it has deeper meanings.

The Manuseript probably dates from the late Middle Ages, based upon a medieval crossbow drawn on one page. Down the years, the book has passed through many hands, including John Dee (1527-1608). It now resides at Yale University.

Who wrote the Voynich Manuseript? Polymath Roger Bacon is usually men- tioned. Given his interest in ciphers and the occult, this surmise is not un- reasonable.

(Schaefer,. Bradley E.; "The Most Mys- terious Astronomical Manuseript," Sky & Telescope, 100:40, November 2000. Ber- man, A.S.; "Try Your Hand at Cracking the Uncrackable," USA Today, August 3, 2000. Cr. V. White via L. Farish.)

Comment. We have passed lightly over a big subject. For more, visit: www. voynich.nu. Or read: Brumbaugh, Ro~ bert S.; The Most Mysterious Manuseript, Carbondale, 1978.

BACON BITS

While on the subject of Bacon and cryp- tology, it was Roger Bacon who may have been involved with the Voynich Manuseript described above, but it was Francis Bacon who, some claim, wrote some of the plays commonly attributed to Shakespeare.

As for the long-claimed possibility of a cipher in Shakespeare's plays; that is, hidden messages; this idea was promoted by that trouble-maker I. Donnelly. His book, The Great Cryptogram (1875), was proof, Donnelly asserted, that it was really Francis Bacon who penned what is now erroneously attributed to Shakespeare.

Donnelly was a great collector of anomalies. From his vast researches carne Atlantis: the Antediluvian World, a book that sparked worldwide interest in that lost city, and the equally seminal Ragna- rok: the Age of Fire and Gravel, that introduced Velikovskian catastrophism 67 years before Worlds in Collision.

THE MYSTERIOUS VOYNICH MANUSCR1PT

THE MOST MYSTERIOUS MANUSCRIPT

Forget the Kensington Stone and Easter Island's "talking boards," the so-called Voynich Manuseript is claimed to be the most mysterious writing on the planet. This 234-page, handwritten, parchment- book is in a class by itself. One's attention is first caught by page after page of truly strange depictions of

One of the astronomical diagrams in the Voynich Manuseript. The meaning of the star symbols in the eight (not the Zodiacal twelve!) sectors is obscure. The language used in the accompanying text is likewise mysteri- ous.

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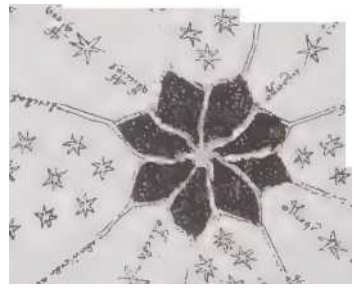

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COIN MAPS, GROOVED BONES, AND M1SCELLANY

COIN MAPS

Most really-old maps were drawn on perishable materials and long ago decay- ed into dust or were eaten by library critters. The CarthaginianB, well-known for their sea-faring abilities before the Romana expunged their culture, stamped some of their maps on their coins. These have survived the ravages of time much better. Those minted between 350 and 320 BC are remarkable ih that they seem to show not only the Mediterranean región but also Britain, Ireland, and a lar ge land mass to the West. Is this numismatic evidence that the Carthagin- ians reached the Americas some 1,800 years before Columbus?

(McMenamin, Mark; "Cartography on Carthaginian Gold Staters," The Numismatist, 109:1215, 1996. Cr. P. Huyghe)

WHEN THE ARCTIC WAS WARM

According to the anthropologists' sche- dule of hominid diffusion across the planet, the Ice Ages blocked most east- west travel at high latitudes until about 12,0 years ago. This date now seems far off the mark. A team of Russian and Norwegian archeologists has located a hominid camp at Mamontovaya Rurya in Russia on the Arctic Circle. Bones of horses, reindeer, and wolves were strewn about this Paleolithic camp.
Most important of all, though, was a 4-foot mammoth bone bearing grooves made by Sharp stone tools------a sure sign of human occupation. The mammoth bone has been dated as 36,000 years oíd.
This is the earliest sign of hominid pre- sence in the high Arctic.

The grooves on the Mamontovaya Kurya mammoth bones were made with Sharp stone tools—but for what purpose?
Was meaningful notation in use 40,000 years ago?

You will notice that we use the word "hominid" rather than human, because the campers may have been Neanderthals. No hominid bones were found to resolve this matter.

The implication of all of this is that, although the Arctic may have been very coid 36,000 years ago, it was largely ice-free.

(Pavlov, Pavel, et al; "Human Presence in the European Arctic Nearly 40,000 Years ago," Nature, 413:64,2001. Wilford, John Noble; "New Evidence of Early Humana Unearthed in Russia's North," New York Times, September 6, 2001. Cr. D. Phelps)

Comment. A nearly ice-free Arctic some 40,0 years ago might have permitted human diffusion into the New World, but so far we have seen nothing this early.

It is likely that the Southern Hemi- sphere was also freer of ice during this period. Although humans had gained Australia by this time, we know of no good evidence that they used Antárctica and the islands of the Southern Ocean to reach the New World.

A MISSING TURKEY

In vol. 1, p. 42, we digested an article claiming that the North American turkey was known in Precolumbian Europe. It had to be, for an obvious turkey ap- pears on the famous Eleventh Century Bayeux tapestry.

However, careful study of a copy of the Tapestry has failed to find this typically New World bird anywhere.

(Sérensen, Erik Ringdal; personal communication, November 2, 1995)

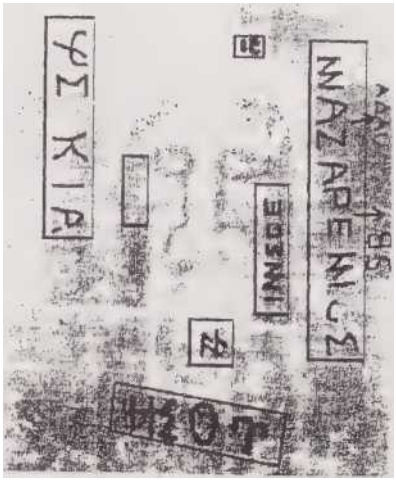
The claimed depiction of a New World turkey upon the Precolumbian Bayeux Tapestry.

MIDDLE EAST

ANCIENT MESSAGES ON THE SHRODD OF TÜRIN

Never before in Science Frontiers have we mentioned the long-debated Shroud of Turin, the supposed winding cloth of Christ. The skepticB thought that they had buried the issue in 1988 when radio- carbon dating apparently proved the shroud was no older than medieval times. But there have been claims that the radiocarbon dates might have been skewed by contaminante accumulated over the centuries.

Now digital-image-processing of the shroud has produced a surprise. Some Latín and Greek letters—undiscernable by the naked eye—have been discovered around the face of the shroud. Probably these marks were intentionally erased ages ago but not completely enough to be mis sed by modern technology.



Greek and Román inscriptions shown as superimposed upon a negative image of the face on the Shroud of Turin.

Paleographists believe these long- unnoticed letters are oriental rather than occidental and ancient rather than medi- eval. Once again, the Shroud of Turin seems to be an authentic relie 2,000 years oíd. Thus the saga continúes.

(Marión, Andre; "Discovery of Inscriptions on the Shroud of Turin by Digital Image Processing," Optical Engineering, 37:2308, 1998. Cr. P. Ferryn.)

AND THEY WENT FORTH AND MULTIPLIED

Archeologists excavating the ancient city of Hazor, in Israel, have uncovered a handy- size chip made from red clay and engraved with symbols. This 3,000-year- old artifact has turned out to be a multíplicatíon table!

(Anonymous; "And in Israel," USA Today, July 30, 1996. Cr. COUD-I. COUD-I = Collectors of Unusual Data - International.)

AFRICA

RIDDLES OF THE SPHINX

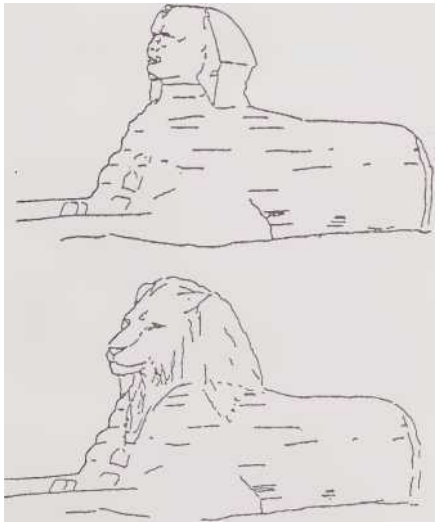
Riddle 1. The body of the Sphinx, which is obviously lionesque, is in bad shape compared to the head. The head we see today is human with a pharaoh's head- dress. The head's workmanship is excel- lent and comparable to that seen in the nearby Great Pyramid. The Sphinx's body, on the other hand, is highly eroded, even though it was completely buried under sand for centuries. This severe erosión led R.M. Schoch to pro- claim that the Sphinx is actually thou- sands of years older than the Giza pyramids, much to the annoyance of conventional Egyptologists. (vol. 1, p. 13) Be that as it may, no one denies

that the Sphinx's head and body are quite different.

Riddle 2. The head of the Sphinx seems too small for the body. None of the many other sphinxes carved by the ancient Egyptians show sucli an error of propor- tion.

To answer both riddles, R. Waters suggests that the original Sphinx was actually carved as a complete lion sev- eral millennia before the Giza pyramids were erected. It was these later pyra- mid builders—those master craftsmen in stone----who recarved the head into human form, necessarily reducing its size relative to the body.

(Waters, Richard; "The Lion King," Fortean Times, p. 54, no. 91, October 1996)



(Top) The Sphinx today. (Bottom) Was the Sphinx originally a lion?

Comment. Waters is not the first to rein- terpret the Sphinx's head.. Others have noticed that the surviving facial features of the Sphinx do not match those of the Pharaoh Chephren, the supposed builder of the adjacent Great Pyramid. J.A. West, in his 1979 book Serpent in the Sky, advances this idea. The lion-head sur- mise has also been mentioned in the recent TV documentary Mystery of the Sphinx. Another suggestion is that the surviving features more closely resemble those of Subsaharan Africans. (vol. 1, p. 13)

AUSTRALI

In many parts of Australia sheer rock walls are decorated with the justly famous artwork of the Aborigines. But other rocks on this island continent boast engravings and paintings that are manifestly anomalous; that is, substantially different from the styles of the Aborigines. For example, the thousands of engraved circles at the Jinmium site in Nor- thern Austraia are controversia! in the matters of age and identity of the engravers. Then there are the flowing lines of the so-called Bradshaw paintings plus a strange bas-relief of a human head, none of which which bear much resemblance to the work of the Aborigines.

•Engravings at the Jinmium Site.

•Atypical Art and Sculpture in Australia.

•Australian Miscellany. Notably, strange circular ground disturbances.

ENGRAVINGS AT THE JINMIUM SITE

CIRCLES OF CONTENTION

No, this is not about crop circles, al- though these are easily as controversial ----at least among anthropologists. The story broke last September (1996), in Sydney, Australia, and has been sim- mering ever since. We have let the story eook for a while, hoping to get some confirmation of the dates involved. This will have to come later.

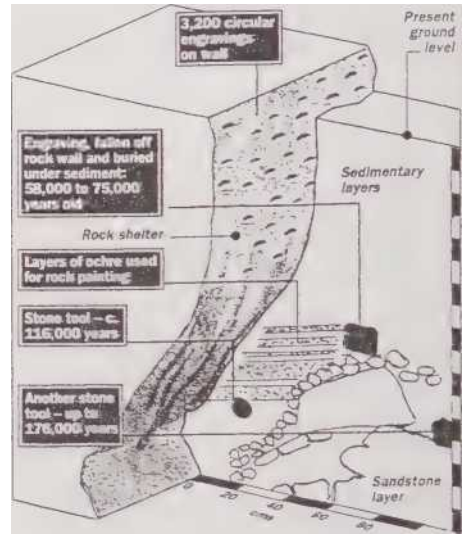
These "circles of contention" are engraved on tall boulders (about 2 meters high on average) arranged in ares hundreds of meters long at a site the aborigines cali Jinmium. Jinmium is located near the western boundary of Australia's Northern Territory. The circles are obviously the work of humans. There are thousands of these etchings all told. Dimensions: 2-3 centimeters across and about half as deep.

No one doubts that the Jinmium site is ancient. Judging from the sediments that cover the lowest circles, these engravings are about 60,000 years oíd.
If this date survives scrutiny, the Jinmium carvings will be the oldest human art on the planet-----twice as oíd as anything found in Europe. No wonder the circles have created a stir.

Actually, though, a larger issue is at stake. In the sediments around the engraved boulders, anthropologists have discovered what seem to be even-more- ancient signs of human activity: stone tools Btratigraphically dated at 116,000 and 176,000 years. The problem here is that most anthropologists hold (rather fervently) that modern humans did not expand out of Africa untíl about 100,000 years ago. Paleoanthropologist R. Klein offered the following pertinent comment:

> **If it could be demonstrated [that] • people were in Australia more than 100,0 years ago, we would have to rethink everything we thought we knew about the later phases of human evolution. (Ref. 1)**

If the Jinmium dates do hold up, they would bolster the unpopular "multiregion-



(Left side) A partially buried boulder with circular engravings at Jinmium. (Right side) The associated stratigraphic levels and buried artifacts.

al" hypothesis, which liolds that modern humans aróse from several protohuman populations—not just that in Africa.
The battle betweén the "Out of Africa" proponents and the multiregionalists has been a fierce one. The Jinmium artifacts may tilt opinión in favor of the latter. That is why this site is potentially so anomalous. ■

But, everything hinges on accurate dating. Some of the dating has been done with a relatively new technique called "thermoluminescenee" or "TL" dating. Since the Jinmium dates are wildly out of line, we may well see some "adjustments" here.

(Ref. 1. Holden, Constance; "Art Stirs Uproar Down Under," Science, 274: 34, 1996. Ref. 2. Woodford, James; "Un- earthed: Australia's Lost Civilization," Sydney Morning Herald. September 21, 1996. Cr. R.E. Molnar. Ref. 3. Bahn, Paul G.; "Further Back Down Under," Nature, 383:577, 1996. Ref. 4. Dayton, Leigh, and Woodford, James; "Australia's Date with Destiny," New Scientist, p. 28, December 7, 1996.)'

ATYP1CAL ART AND SCULPTURE IN AUSTRALIA

ALIENS, MYSTERY RACES, OR ABORIGINES?

Some of Australia's rock art------the Wandjina paintings-----depiets humanoids in full-length gowns with strange halos encir- cling their heads. Those favoring the "ancient astronaut" theory assure us that the Wandjina figures are those of alien visitors! The so-ealled Bradshaw paintings don!t fit in the "alien" category but they are so interesting that we choose to reproduce one here. It raises three problems:

(1) The slim, flowing human ñgures remind one more of the Tassili rock art found in Africa's Sahara rather than that of the Australian Aborigines;

(2) The objects at the left are enig- matic and technical-looking; and

(3) The symbols (?) at the top are undeciphered.

The artiele at hand from Antiquity does not attempt to interpret the Bradshaw art. Instead, it discusses the social factors that mold the interpretation of the Wandjina and Bradshaw paintings. Víhen Europeans first saw these paintings they were certain that their "advaneed style" was far beyond the capabilities of the Aborigines (colonial prejudice). They must, therefore, be the work of "pre- Aborigines." Today's Aborigines will have none of this eondescension. They v'ere the original settlers of Australia, and as such they have bona fide land and title claims. Any recognition of "pre-Aborigines" would undercut these claims.

(McNiven, Ian J., and Russell, Lynette; "'Strange Paintings[1] and 'Mystery races[1]: Kimberly Rock-Art, Diffusionism and Colonialist Constructions of Australia's Aboriginal Past," Antiquity, 71:801, 1997.)

PROBLEMS OF ABORIG1NAL ART IN AUSTRALIA

Below, we reproduced some Australian rock art featuring sylph-like, flowing human figures quite unlike today's aborigines. In our more recent library searches, we have come across an oíd artiele that provides additional examples of the so-called Bradshaw paintings— more of those graceful human forms with long, billowing tresses. Very out-of- place in today's Outback.

The same artiele adds an even more puzzling human representation to the burgeoning file of mysterious Australian art. It is a carving found in a cave of northwestern Australia. Here is the text accompanying the sketch.

> Another cave introduced a fresh problem. Fronting it, high up on the vertical face of a cliff, and un- reachable without mechanical aid, had been carved out of the solid stone a human head in profile, which I show.

> It was 2 feet long and 16 inches across, and li-inch thick; and I leave my hearers to say whether it is not a striking and distinguished face. It is absolutely different from the heads of modern Aborigines. The worn edges of the carneo, where it joined the rock-surface, seemed to mark a long interval since it was carved; the difficulty of carving it where it stood must have been im- mense unless, indeed, the rock face liad been neai[i] the ground at the time, and the ground had worn away since ■ —which, again, would probably im- ply antiquity.
>
> What a problem this Caucasian face presents! Is it that of some stranger from Europe long ago----perhaps before the Portugese or Spanish visitors of the sixteenth and seventeenth centuries? In all probability European ships traversed the Pacific before the days of Balboa; for Greek columns are found in an island of the South Seas; and the prevalence of small-pox among the Australians when we first settled there is said— with what truth I must leave patholo-
> gists to decide----to postúlate previous residence of Europeans amongst them.

(Thornton, S.; "Problems of Aboriginal Art in Australia," Victoria Institute, Journal of the Transactions, 30:205, 1897.)

AUSTRALIAN M1SCELLANY

TRACTORS OF THE GODS?

We are all familiar with the Nazca Lines of South America and the wild theories about the aliens that drew them on the high arid plateaus.

> ...now, new patterns have appeared on some parched ground in remóte northwestern Australia, a series of spirals, circles and broken wavy lines by the North West Coastal High- way near Roebourne.
>
> Dick Smith noticed them while flying over the area in June 1988. By virtue of their large size they are, like their ancient counterparts, clear- ly visible only from the air. Dick photographed them and in due course asked me to try to find out what they were. Simple, I thought, they must be for erosión control or some other form of land management.

C. Ilill inquired at several govern- ment agencies to no avail. No one knew anything about them.

(Hill, Chris; "Tractors of the Gods?" Australian Geographic, p. 25, July-September 1990. Cr. L.S. Nelson)

Comment. We assume that these curious marks have a modern origin, but one cannot be sure. Ground'markings sur- vive undisturbed for long periods in such arid regions. Also, many large- scale ground drawings were made in the past by Australian aborigines.

Some of Australia's Bradshaw paintings illustrating their "advaneed" flowing style. Note apparent symbols at top and curious objects to the left. ■

DIFFUSION AND CULTURE

The origin and diffusion of ancient cultures is a multi-faceted subject. In our 2003 book Scientific Anomalies and Other Provocative Phenomena, we broke this subject down into 14 categories of anomalies. In this collection of over a decade of issues of Science Frontiers (1993-2004), 11 of the 14 are included. We have also had to add a 15th. category (last on the list below). For readers without a copy of Scientific Anomalies and Other Provocative Phenomena, the three categories missing from this compilation are: «Diffusion of Carnes and Recreational Devices; «Dynamics and Interrelationships of Ancient Cultures; and «Religious Affinities Suggesting Anomalous Diffusion of Peoples. Our files, however, bulge with scientific reports in all 15 categories. In this book, we attend to the following dozen subjects:

«Human Physical Appearance. Anomalous physiological types.

«Biochemical Evidence for Diffusion. DNA, blood types, etc.

«Cultural Phenomena of Ancient Peoples. Tattooing, for example.

•Art and Music.

•Anomalous Hominid Skeletons. Kennewick man, etc.

«Ancient Farming and Hunting Practices.

«Ancient Transoceanic Commerce and Voyaging.

«Language Anomalies. Hints of Precolumbian diffusion.

«Myths, Leqends, Traditions. Effects of astronomical conjunctions.

«Diffusion of Plants, Animáis, Diseases.

•Ancient Science and Technology.

«Natural Catastrophes Leading to Archeological Anomalies. Possible nuclear catastrophies resetting radiometric docks.

From the above list it may be concluded that the major anomalies discussed are concerned with the diffusion of people, anomalous cultural sophistication, the extent of ancient seafaring, and precocious Science and technology. But you will find many more observations below that contradict prevailing paradigms.

HUMAN PHYSICAL APPEARANCE

WERE FAIRIES AN EARLIER RACE OF MEN?

After wondering if this is a ridiculous and/or frivilous question, read the folio wing summary paragraph from a re- view of global folklore and legend. Then, consider all that has been written about wildmen and possible late survivals of Homo erectus and Homo neanderthalis and their consequent, inevitable contacte with modern humans.

> **Reviewing the evidence as a whole, we may conclu.de that while some traits of fairies and dwarfs suggest an earlier race of men, others when traced back, are found to be purely animistic in ongin. Jtíven where, in Polynesia, Melanesia, and Africa, certain groups of fairy-like beings seem to be an earlier race trans- formed, many things said of them are non-human—their tiny size, their supernatural powers, their spirit aspect. These require explana- tion. With every allowance for facts, the existence of an early pygmy or dwarfish race cannot be the solé cause of the belief. Probably the be- lief in the manakin soul, no less than general animism, and also human imagination and dreams had great influence in its formation... Yet it must be remembered that man always tends to regard the beings of his creed in his own likeness—he never knows how anthropomorphie he is. In so far as the fairy tradition is con- nected with actual men, it may go back to the hostile relations existing between Paleolithic and Neolithic groups. Men of the Oíd Stone Age, driven out by Neolithic invaders, would act toward them in some of the same ways ascribed to fairies; and in accordance with the rule that incomers regard aborigines as more or less supernatural, demonaic, possessed of powerful magic, they would be viewed more or less mysteriously.**

(Macculloch, Canon J.A.; "Were Fairies an Earlier Race of Men?" Folk-Lore, 43: 362, 1932.)

BIOCHEMICAL EVIDENCE

DNA ÜNDERMINES FEY TARADIGMS

Lately, the Wall Street Journal has expanded its coverage from stocks and bonds to the María lights and other scientific anomalies. Now, it is challeng- ing areheologieal sacred cows using mitochondrial DNA. Quite a switch from pork futures! Of course, the WSJ is not a recognized scientific source, but its repórter did get his Information directly from D.C. Wallace, a well-known profes-, sor of genetics and molecular medicine ' at Emory University and a Champion of the African Eve theory.

Anyway, Wallace has been studying mitochondria, those little energizers in human and animal cells. Strangely, mitochondria have their own DNA, which is sepárate and distinct from the nuclear DNA that directs other biological pro- cesses. Mitochondrial DNA has had its own history of evolution and is different for various human populations. Wallace

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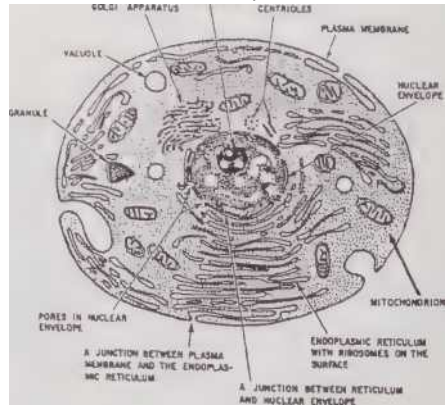


Surely an unusual iüustration for this chapter on archeology, but the DNA in the mitochondria in miniscuíe human cells may upset long-held theories of human diffusion across the planet. DNA may even by more important than stone artifacts and skeletal material.'

has used this fact to trace the origine of American Indians by comparing their mitochondrial DNA with that from Asians, Africans, etc. His conclusions are contro- versial to say the least.

•The Amerinda, who comprise most of the Native Americana, arrived in a single migratory wave 20,000-40,000 years ago—not merely 12,000 years ago!

•Native Siberiana lack a peculiar mutation of mitochondrial DNA that ap- peared in the Amerinds 6,000-10,000 years ago, casting doubt on the Siberian land bridge theory. Instead, this particular mutation is found in Southeast Asia, Melanesia, and Polynesia.

•The Navajos, Apaches, and other so- called Na-Dene peoples entered North America a mere 5,000-10,000 years ago. The article does not say from where.

(Bishop, JerryE.; "A Geneticist's Work on DNA Bears Fruit for Anthropo- logists," Wall Street Journal, November 10, 1993.)

MOLECULAR CLOCK PLACES HUMANS IN NEW WORLD 22,000-29,000 BP

This is welcome news for anomalists who have been searching for a way to demo- lish the 12,000-BP (years Before Present) barrier erected across the Bering Land Bridge by the archeological estab- lishment. But don't uncork the champagne yet, because molecular docks are not like Big Ben.

Here's what has happened: A. Tor- roni and some eolleagues at Emory Uni- versity have analyzed the mitochondrial DNA (mtDNA) of members of seven lin- guistically related tribes in Central America called the "Chibeha speakers." Assuming that the homogeneous group separated from the other Amerind tribes 8,000-10,000 years ago, the Emory group found that their mtDNA had mutated at the rate of 2.3-2.9% per million years. (Note: this works out to 0.0022-0.0029% per thousand years----- a very small amount to measure aecurate- ly!) Next Torroni et al measured the mtDNA of 18 other tribes throughout the Americas and, using the mutation rate just mentioned, computed how long ago these peoples had diverged from a common ancestor. The result: 22,000
29,0 years ago. The Emory study was published in the February 1, 1994, issue of the Proceedings of the National Acad- emy of Sciences.

All this is very well, but suppose that the tribes had split from that common ancestor before they even crossed the Bering land bridge into the New World, thereby starting the molecular dock too early? Or, perhaps Southeast Asians arriving by boat tossed sand into the gears of the vaunted molecular docks?

So, be careful with this apparent anomaly. Molecular docks are tricky.

(Holden, Constance; "Early American Gene Clock Gains Time," Science, 263: 753, 1994. Also: Anonymous; "DNA Dates for First Americans," Science News, 145:126, 1994.)

ANTHROPOLOGY UNBOUND

At the February 1S98 annual meefing of the American Association for the Ad- vancement of Science (AAAS) in Phila- delphia, anthropological heresies ran rampant. One of these heresies fits in here; two more fall into the section on language later in the ehapter under the same title.

•Studies of DNA diversity among New World Indian populations find such large differences that at least 30,000 years would have been needed for these differences to develop. (Assuming, of course, a relatively homogeneous group of initial colonists.)

(Lore, David; "Bering Strait May Not Have Been Only Route to Americas," Columbus Dispatch, February 17, 1998. Also: Gibbons, Ann; "Mother Tongues Trace Steps of Earliest Americans," Science, 279:1306, 1998.)

WILL mtDNA TRUMP C^{14} AND PROJECTILE POINTS?

Do not imagine for a minute that the Clovis Pólice are suceessfully suppres- sing all radical notions in archeology. Revolutionaries are everywhere. Not the least of these are studying the mtDNA (mitochondrial DNA) of Native American peoples and comparing it with the mtDNAs of Asians and Europeans. The geographical distribution of mtDNA haplogroups can trace out the migratory routes of early humans in the New World and, in addition, provide rough times-of-arrival. Some of this mtDNA evidence will undoubtedly attract the attention of the Clovis Pólice. But do these law enforcers—mostly archeolo- gists----daré to challenge genetic data? Can mtDNA lie?

There are in the eells of North American Native Americans mitochondria that seem to divide these peoples into four major "haplogroups." These four groups can be readily traced back to Siberia and northeast Asia. No trouble from the Clovis Pólice here!

But there is also a "haplogroup-X" that does not flt the Clovis paradigm. In North America, haplogroup-X is found frequently among the Algonkian-speaking tribes, such as the Ojibwa. This same haplogroup occurs in Europe and the Middle East, especially Israel. It is notably absent in Asia. Furthermore, the data suggest that haplogroup-X was resident in North America thousands of years before the Vikings and Columbus made landfall.

(Schurr, Theodore G.; "Mitochondrial DNA and the Peopling of the New World," American Scientist, 88:246, 2000.)

Comment. The European mtDNA could have been injected into North America by the Solutreans or other early Atlantic crossers. But it could also have dif- fused across Asia and thence across the Bering Strait. This route would be con- sistent with the recent discoveries of Caucasoid mummies in Asia and Kenne- wick Man. We wish we knew which haplo- ' group ineludes the blue-eyed, light- skinned Mandan Indians?

A FAR-WANDERING TRIBE?

The Lemba, a Bantu-speaking people of Southern Africa have a tradition that they were led out of Judea by a man named Buba. They practice eir- cumcision, keep one day a week holy and avoid eating pork or piglike animáis.

As the author of the above words, N. Wade, is quick to point out, there are several other groups of people around the World who practice Judaic rites or claim to be of Je wish ancestry but have no provable ancestral con- nections.

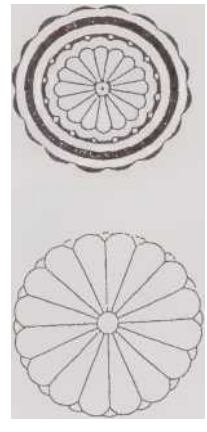
The Lemba, however, also have a genetic tie. Lemba males carry a dis- tinctive set of genetic mutations in their Y chromosomes. This particular genetic characteristic is strongly associated with the eohanim, the Jewish priests said to be descendants of Aaron. This genetic trait is less common among lay Jews (only 3-5%) and very, very rare among non-Jews. This "cohén genetic" signa- ture (cohén = priest) is considered diag- nostic of populations of Jewish ancestry.

(Wade, Nicholas; "DNA Confirme Jewish Ancestry of African Tribe," Houston Chronicle, May 10, 1999. Cr. D. Phelps. Anonymous; "DNA Ties African Group to Jews," Chicago Sun-Times, May 10, 1999. Cr. J. Cieciel)

THE ZUÑI ENIGMA

The Zunis of New México are different from other Native Americans in many ways. In an impressive, very detailed paper in the NEARA Journal, N.Y. Davis summarizes her investigation of these anom alies as follows:

...evidence suggesting Asian admixture is found in Zuni biology, lexicón, religión, social organization, and oral traditions of migration. Pos- sible cultural and language links of Zuni to California, the social disrup- tion at the end of the Heian period of the 12th century in Japan, the size of Japanese ships at the time of proposed migration, the cluster of significant changes in the late 13th century in Zuni, all lend further



The Zuni sacred rosette (top) closely resembles Japan's national symbol, a stylized chrysanthemum.

credibility to a relatively late pre-historic contaet.

We cannot delve into all classes of evidence adduced by Davis. Let us focus on the Zuni biological anomalies:

Skeletal remains. Tbese show a signi-ñcant change in Zunl physical eharacter-istics from 1250-1400 AD, suggesting the arrival of a new element in the Zuni population.

Dentition. Three tooth features of the Zunis lie midway between those of Asians and other Native Americans; namely, shoveling, Carabelli's cusp, and 5-cusp pattern on the lower second molar.

Blood-group characteristics. Blood Type B is frequent in East Asian popula- tions but nearly absent in most Native Americans. Zuni, on the other hand, have a high incidence of Type-B blood.

The "Zuni disease". The kidney dis- ease mesangiopathic glomerulonephritis is much more common among the Zuni than other Americans, and it is also very common in the Orient.

(Davis;'Nancy Yaw; "The Zuni Enigma," NEARA Journal, 27:39, Summer/Fall 1993. NEARA = New England Antiquities Research Association)

THE IRISH IN ICELAND

That the Norse colonized Iceland, Green-land, and even a bit of North America is not contested today. What is a hot issue on Iceland is whether today's in- habitants are predominantly Irish or Norse. The pro-Irish faction maintains that most Iceland settlers were Irish wives and slaves installed there by the Norse. The scientific basis for this claim is the distribution of blood types; speeifically, types A and AB. In Iceland these two types are present in 19% of the populace. In Norway the figure is 30%, while Ireland weighs in with 18%—matching modern Icelanders very closely. Modern Norse match other northern Europeans in this respect, not the Ice-landers.

Somewhat smugly, the pro-Irish faction notes that in Viking days the Irish had the highest literacy. rate in northern Europe. And of all the Norse colonies, only the Icelanders recorded their history (the "sagas"). Ergo, the Irish exerted a strong influence in Iceland more than a millennium ago.

Possibly, say the anthropologists, but small pox may have skewed the Ice- land population figures. People with blood types A and AB are much more susceptible to small pox. The six de-vastating Icelandic small pox epidémica between 577 and 1061 would have hit Norse settlers harder than the Irish the Norse had brought along with them, thereby boosting the fraction of Irish in the modern Iceland populace.

Whatever the scientific explanations, today's Icelanders are thronging to Ire-land on shopping and drinking trips! They know where they carne from!

(MacKenzie, Debora; "Icelanders Argüe over their Aneestors," New Scientist, p. 10, June 1, 1996)

VTRUSES AS ANCIENT ARTIFACTS

HTLV-1 is a blood-borne retrovirus that causes leukemia in about 3% of those carrying it. In Southern Japan, roughly 4% of the populace are afflicted with this virus, so are some isolated groups living today in Columbia and Chile. Does this correlation prove that South America received settlers from Japan in the dis- tant past? Sueh a biological linkage would augment pottery evidence from Perú and, espeeially, Ecuador where Jomon-style pottery 4,000-5,000 years oíd has been found on the coast. How- ever, the HTLV-1 virus also could have been introduced to South America by more recent visitors. Is there any way to fix the timing of HTLV-l's introduc- tion to South America?

Actually, there is. The DNA in viruses is not as durable as pottery shards, but it does hang around for a while, as seen is recent efforts to ex- tract DNA from from frozen mammoths for possible "revival" of the species.

A team of Japanese and Chilean sci-entists has been searching for DNA surviving in 104 mummies deposited in South America's arid Atacama Desert 1,200-1,500 years ago. Two of the mummies still retained DNA; and one of them included shards of DNA from HTLV-1. This certainly doesn't prove trans- Pacific diffusion, but it helps.

(Holden, Constance; "Backtracking a Mummy Virus," Science, 286:2071, 1999)

CULTURAL PHENOMENA

MAORI AND EGYPTIAN SKIN-TATTOOING

We have so far inspected only a few dozen volumes of the Journal of the Polynesian Society, but this publication has already yielded a wealth of potential anomalies observed in Oceania and else- where.

In support of this claim, we reproduce below sketches of chin tattoos of three women of üpper Egypt and a Maori woman from New Zealand. These sketches were submitted by a General Robley, who also added that the ornamental designa on some of the earlier Egyptian mummies are identical to some of the older Maori patterns.

The significance of these comparisons is seen the the article's final paragraph:

.. .it will probably throw light on the question of the intercourse between the ancient Polynesians and the Egyp- tians in ages long past, which, from other things seems probable—not, we think, that there is an ethnic connec- tion between the two races, but that there has been intercourse and mutual interchange of customs and ideas, probably when the Polynesians occu-pied India.

(Anonymous; "Maori and Egyptian Tattoo- ing," Polynesian Society, Journal, 13: 104, 1904.)

Comment. In support of far-ranging contacte by the ancient Egyptians are tantalizing and controversial artifacts and rock paintings found in Australia, (vol. 1, pp. 18, 42)

EL NINO-----BUENO?

Despite our recent experienees with them, El Niños have not been all bad.
All around the Pacific Basin, scientists have been collecting evidence that, between 12,000 and 5,000 years ago, El Niños were virtually nonexistent and that their reappearances often coincided with great cultural changes.

To illustrate, coral records from the western Pacific and sedimenta in the Great Lakes indícate that El Niño was going strong before 12,000 BP, but then there was an unexplained, 7,000-year lull. This lull is also seen clearly in sedi- ments in Laguna Pallcacocha, a lake in the Andes of Southern Ecuador, so is El Nino's sudden resurgence around 5,000 BP.

This resurgence and the associated worldwide climatic turmoil also marks the emergence of complex societies all over the planet. The Egyptians built pyramids, the Peruviana constructed temple mounds, civilizations rose and collapsed in the Middle East, and settled agrarian societies developed in many lo- cations. Although not all cultures responded well to the climate changes, El Niño seems to have sparked the rise of modern civilizations. We are assuming that this was goodl

(Kerr, Richard A.; "El Niño Grew Strong As Cultures Were Born," Science, 283:467, 1999. Sandweiss, Daniel H., et al; "Transitions in the Mid-Holocene," Science, 283:499, 1999.)

Comment. Wasn't that period of Global Warming between 12,000 and 5,000 BP the Golden Age when Atlantis throve, when Antárctica was ice-free, when the Sphinx was really built, and when the Garden of Edén was sinless?

ART AND MUSIC

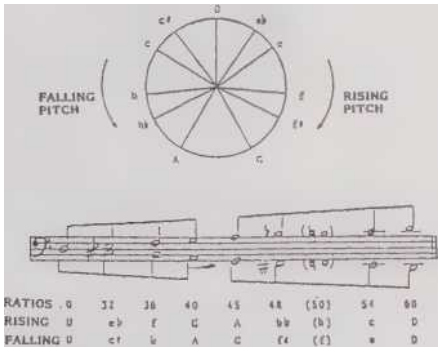
MUSIC AND THEORIES OF EVERYTHING

Warning: We never promised that Science frontiers would be easy or even compatible with your world view! Fur- thermore, archeology is more than pot- tery shards and arrowheads.

Today's physicists enjoy speculating about Theories of Everything, but they really don't nean everything! They just mean physics and cosmology. Some 5,000 years ago, the Sumerians eonstructed a remarcable Theory of Everything based upon music, a base-60 number system, and symmetry concepts. These Sumerians didn't have supercomputers but they were able to incorpórate into their theory much more than physics and cosmology. Below, E.G. McClain provides some in- sight into aneient Sumerian thinking:

> **In aneient Mesopotania,music, mathe- matics, art, Science, religión, and poetic fantasy were fused.- Around 3000 B.C., the Sumerians simultan- eously developed cuneiform writing, in which they recorded their pan- theon, and a base-60 number system. Their gods were assigned numbers that encoded the primary ratios of music, with the gods' functions cor- responding to their ntimbers in acous- tinal theory. Thus the Sumerians created an extensive tonal/arithmeti- cal model for the cosmos. In this far- reaching allegory, the physical world 5s known by analogy, and the gods give divinity not only to natural forces but also to a "supernatural," intuitive understanding of mathemati- cal patterns and psychologieal forces.**

To understand the role of musical theory in modeling the cosmos, one must realize that it involves: "the definition of intervals, the distance between puches, by ratios of integers or count- ting numbers." For the aneient Sumerians music was a tool that helped them describe the cosmos.



The Sumerian musioal-mathematical representation of "Poseidon and His Ten Sons." The Sumerians obviously had a different way of déseríbing the cosmos, and myth was integral to it.

(McClain, Ernest G.; "Musical Theory and Aneient Cosmology," The World and I> P- 371. February 1994. Cr. L. Ellen- berger)

Comment. Five thousand years ago, the Sumerians were (supposedly) just emerg- ing from barbarism. What did they need all this musical and mathematical modeling for? Why did their sophisticated analyti- cal talents evolve at all? They would seem to have little survival valué.

HOMINID SKELETONS

KENNEWICK MAN: A 9300-YEAR-OLD CAUCASIAN SKELETON IN NORTH AMERICA?

The town of Kennewick, Washington, has lent its ñame to this ferociously controversial skeleton. It all began when the local sheriff asked anthropologist J. Chatters to take a look at a partially buried skeleton found on the shore of the Columbia River. (Ref. 1)

> **From head to toe, the bones were largely intact. Tile skeleton was that of a man, middle-aged at death, with Caueasian features, judging by skull measurements. Imbedded in the pelvis was a spearhead made of rock.**

Chatters initially thought he had merely a "pioneer" who had met an un- timely death in the Wild West!

> **The real stunner carne last month [June 1996], after bone samples were sent to the University of California at Riverside for radiocarbon dating. The conclusión: the skeleton of the "pioneer" is 9,300 years oíd. (Ref. 2)**

Actually, the skeleton may well be that of a "pioneer" but one who carne from the direetion of the setting sun instead of the rising sun. Of course, it is perfectly all right for Asians to have crossed the Bering Strait into North America over 9,000 years ago, but a Caueasian raises scientific and emotional problems.

> **If Kennewick Man were actually Cau- casian, it would be a startling dis- covery. So far, all of the oldest North American skeletons have been of Asian descent, althougli features on a few skulls have been controver- sially interpreted as Caucasoid.**
> **Another possibility is that the first Americans----and their Asian ancestors —had features that were Caucasoid. The real test of these theories would be DNA, which can pinpoint which modern populations are most closely related to the skeleton and so help identify the ancestors of early Americans and perhaps give clues to their migration patterns. (Ref. 3)**

But Science may not get the oppor- tunity to make the desired DNA tests.
The local Umatilla Indiana insist that the bones of Kennewick Man be surrendered to them for immediate reburial, as stipulated. by the North American Graves Protection Act of 1990. But if the bones are truly

The well-publicized reconstruction of the skull of Kennewick Man. Caueasian characteristics are claimed.

those of a Caueasian, does the Act ap- ply? And when does the scientiñc valué of a skeleton outweigh native tradition? Ironically, the Umatilla Indians scoff at the idea of Asian diffusión across the Bering Strait. They claim that they have always lived in the Pacific Northwest! (Ref. 4)

Comment. Perhaps pertinent are the Caueasian mummies recently discovered in China (p. 29) and, even more recently, 3,000-year-old graves uncovered at Baifu, just north of Beijing. These graves have yielded skeletons and arti- faets with Caueasian characteristics. (Ref. 5)

(Ref. 1. Anonymous; "Indian Bones," Earth Changes Report, November 1996. Cr. S.M. Johnson. Ref. 2. Egan, Timo- thy; "Tribe Stops Study of Bones That Challenge History," New York Times, September 30, 1996. Cr. M. Colpitts. Ref. 3. Gibbons, Ann; "DNA Enters Dust Up over Bones," Science, 274:172, 1996. Ref. 4. Lemonick, Michael D.; "Bones of Contention," Time, 148:81, October 14, 1996. Ref. 5. Bower, B.; "Early Cross-Cultural Ties Arise in China," Science News, 150:245, 1996.)

AMERICA B.C. AND THEN SOME!

B. Fell and some other epigraphers have claimed that a large corpus of inscrip- tions found on rock walls and tablets all across .North America proves that Europeans frequented this continent long before Columbus, perhaps 1,000 or more years before. Mainstream archeologists and anthropologists vigorously rejeet such claims. The scratches are merely plowmarks and the tablets are frauds.

As customary in these newsletters, there is a "however"! Some even more aneient North American bones are telling an even older tale. Besides Kennewick Man (above), that well-preserved Caucasoid skeleton found recently in Washington state, there are a half dozen or so other well-dated North American skeletons that do not appear to be Asiatic.

These skeletons are 8,000 or more years oíd and resemble those recently dis- covered in Asia. Collectively, they indi- cate that early Caucasians were far- ranging indeed. (Also, the Ainus now living in Japan have some Caucasian features.) It is possible that Caucasians preceded or accompanied Asian peoples across that famous Bering Land Bridge. They may even have helped found some of the Native American populations. (Re- call the blue-eyed Mandans?)

Despite the political incorrectness of Caucasians in "America B. C." some scientists seem ready to accept the testi- mony of the bones, even while rejecting later epigraphic evidence. D. Stanford, at the Smithsonian's National Museum of Natural History, muses:

> I think we're going to see the whole complexión of North American pre- history change real fast.

(Rensberger, Boy ce; "First Settlers to Reach America May Have Been Cauca- soids," Columbus Dispatch, May 5, 1997. Cr. J. Fry via COUD-I)

Comment. Our title refers to B. Fell's controversia! book America B.C.

TOO MANY YEARS AGO, TEXAS QUICK MÜD CAPTURED A YOÜNG WOMAN

To be sure, the ground looks solid enough along parts of Texas's Coastal plain, but beneath the thin crust of sedges and grasses there often lurk pockets of sticky quick mud. Even tó- day, they tell stories of people who break through the crust. Sometimes the bodies are recovered; sometimes not.

"Sometimes not" was, until recently, the fate of a woman in her twenties who was pieking her way across the marshy terrain some 13,000 years ago. Her bones were exposed a couple years ago by a backhoe operator. There was no sign of a grave, ñor of a violent death. The position of her bones was peculiar, though. Her skull was on top with the rest of her bones distributed beneath, as if she had died in a standing position. It seems that Brazoria Woman (named after the Texas eounty) had slipped feet first into the slough'6 quick mud, could not extricate herself, and sank deeper and deeper.

Gruesome as this ancient tale may be, the real surprise is the age of Brazoria Wornan[1] s bones. At 13,000 years, as carbon-dated at the University of Ari- zona, her bones are the oldest known human remains in Texas and among the oldest in the New World. She is 3,000 4,0 years older than Kennewick Man and roughly contemporary with Penon Woman III unearthed near México City, (below)

(Pinson, Ariane; "Texas Marsh Reveáis 13,000-Year-dd Human Remains," Mam- moth Trumpet, 18:17, March 2003.)

Comment ■ The skull of Brazoria Woman is m fragments too small for reconstruction, so speculation cannot be made about her relationship to Penon Woman III, whose skull suggests a link to the Ainu of Japan. In any case, human skulls are variable, and grand theories should not be based upon subtle differences in their shapes.

ANCIENT BONES ON SANTA ROSA

Just off the coast of Southern California, lies Santa Rosa, one of the Channel Is- lands. There, recently, two female thigh bones have been dug out of a gully at Arlington Canyon. Radiocarbon-dated at 13.0 years, they are 1,400 years older than the benchmark Clovis sites. The signifícance of the Santa Rosa bones is explained in the following quotation.

> The new discovery is likely to be controversial in part because many scientists say that the oíd skeletons found in the past few years around the western United States do not resemble modern Native Americans. De- tailed examinations of the skulls re- veal slender faces, narrower brain eavities, high foreheads and slightly protruding chins that are more typical of Caucasoid peoples.
>
> Some of them bear striking resem- blance to a very ancient race called the Ainu, a maritime people who were the forerunners of the Polynesians and long ago occupied Japan and China.

(Polakovic, Gary; "Channel Island Woman' s Bones May Rewrite History," Los Angeles Times, April 11, 1999. Cr. E. Roy. Abbreviated versión in the Houston Chronicle, April 12, 1999. Cr. D. Phelps)

Comments. It should be noted that Santa Rosa is also known for ancient "fire areas" ("hearths"?) where dwarf mam- moths were roasted (intentionally?) over 13.0 years ago. (See: Archeological Anomalies: Small Artifacts for details.)

Stretching our theme a few thousand more miles, Jomon-style pottery has turned up on the coast of Ecuador.

ALASKA'S "MUMMY PEOPLE," WERE THEY AINUS?

When the Russians first arrived in the Aleutian Islands in the mid-Eighteenth Century, they encountered the remnants of a mysterious ethnic group now called the "mummy people," Although these people did mummify their dead-----like several other ancient cultures—they were far from being cadavers when they drove the Russians off the beach of Kodiak Island with a rain of Sharp darts, spears, and lances. According to a recent article in Ancient American, they also launched large stones at the Russians using catapults! Proteeted by body shields made of wood covered with raw- hide, the mummy people—what was left of them—were formidable warriors. But who were they?

Actually, the Russians were not the first to meet the mummy people in mortal combat. The eskimos had faced them in their island-by- island conquest of the Aleutians begun several centuries earlier. Today's Aleuts carry a mixture of Eskimo and mummy-people genes.

It is the uncertain origin of the mummy people that intrigues the most. They are thought to have arrived in the Aleutians some 7,000 years ago—but from where? Helping to answer this question are thousands of their mummies unearthed over the last 300 years. Their bones resemble those of the Ainus still surviving in northern Japan. Like the Ainus, the mummy people possessed some Caucasian features. In íact, some had reddish hair.

The Ancient American article adds that the ancient Aleuts used the decimal system, manufaetured white parchment, and made fires using combustible sulphur and sparks struck from pyrite.

(Pettyjohn, F.S.; "Who Were the Caucasian 'Mummy People' of Alaska?" Ancient American, no. 39, p. 26, 2001)

Comment. For earlier speculations about possible Ainu incursions into North America, see p. 20. We wonder how Kennewick Man and those Caucasian mummies recently exhumed in Asia fit in. (pp. 29 and 47)

DID THE AINU REACH MEXICO?

An oíd skull designated Peñón Woman III, dug up near México City, has been carbon- dated as being between 12,700 and 13,0 years oíd. Peñón Woman III is now claimed to be the oldest skull found in North America.

Besides smashing the Clovis-First Barrier (12,000 B.P.), this skull is also elongated and narrow, quite unlike the skuUs of virtually all other Native Americans. Geologist S. González compares the Peñon-Woman-III skull to those of the Ainu, a race now confined to northern Japan. González hypothesizes that as long ago as 25,000 years, the Ainu, once noted for their sea- faring capabilities, explored the Pacific coast from Alaska south to Central America. González points also to the now-extinct Pericue people of Baja California who share the skull characteristics of Peñón Woman III. Perhaps the wandering Ainu established a colony there in pre-Clovis times!

The skull of Penon Woman III was dug up near México City's International ' Airport. (National Museum of Anthro- pology, México)

(Legón, Jeordan; "Scientist: Oldest American Skull Found," CNN.com, De- cember 4, 2002. Cr. M. Colpitts.)

Cross references. Related claims in this group of digests: (1) The Ainus may have been Alaska's "mummy people"; and (2) Brazil's Luzia skuH, dated at about 11,500 years, resembles those of Polynesians. (More on Polynesians below)

MORE BONES THAT DON'T BELONG

More anomalous than Kennewick Man (that 9,300-year-old skeleton from Washington with Cauc asían features (p. 47). is a skull from Brazil dubbed Luzia.
Luzia was a female, aged 20-25, who lived near Belo Horizonte in southeastern Brazil. Luzia's skull and other arti- facts carne from a campsite carbon-dated by labs in Brazil and France as being about 11,500 years oíd. This makes Luzia the oldest skeleton ever found in the Americas—assuming this whole story hangs together.

The 11,500-year date is impressive enough, but anthropologist W. Neves, University of Sao Paulo, asserts that Luzia's skull and teeth are not Mongo- loid but really characteristic of the South Sea islanders. Such observations agree with the studies of skeletal material by J. Powell, University of New México. Powell has concluded that the oldest settlers of the New World probably did not trek aeross the Bering Land Bridge from Asia but carne from elsewhere.

(Borden, Keefe; "Skull Find Redefines American Ancestry," Austin American-Statesman, May 24, 1998. Cr. D. Phelps)

EARLY AUSTRALIAN VISITORS TO THE NEW WORLD?

A new BBC documentary entitled Ancient Voices proclaims that the first settlers of the New World were from Australia and Melanesia. Skulls thought to be 9,000-12,000 years oíd have been unearthed in Brazil with features that closely match those of Australians living about 60,000 years ago. (p. 38) Evidence of even earlier contacts comes from stone tools and charcoal at Serra da Capivara, in northeastern Brazil. These artifacts indícate human habitation as long as 50,000 years ago.

These very early Australians, however, seem to have been exterminated by a later wave of Mongoloid invaders. W. Neves, University of Sao Paolo, has measured hundreds of skulls between 7,0 and 9,000 years oíd. He notes a marked change in skull shape during that period going from exclusively Australian to totally Mongoloid.

(Anonymous; BBC Online Network, August 26, 1999. Cr. M. Colpitts.
For details, visit http://news.bbc.uk/ hi / english / sci/ tech / newsid_43 000/ 430944. stm)

Comments [1] [2] [3]

(1) The claimed Mongoloid invasión of Brazil jibes nicely with claims of early Chínese visits to the New World.

(2) The artifacts at Serra da Capivara support the findings of N. Guidon at Pedra Furada, Brazil—also said to be about 50,000 years oíd. (p. 27)

(3) The references given above pe not science journals, so eaution is advised.

ANCIENT POLYNESIANS IN SOUTH AMERICA

Somehow, when we trolled through the venerable Geographical Journal for 1901, we missed an article that mentioned some unmentionable artifacts found in South America. We have now snared them in another source. We quote F.P. Moreno briefly.

> I shall not enquire here into the com- mon origin of some of the Pacific Ocean races with those of South America, or into the similarities which they offer, explainable only by land connections; but I will merely mention that in the graves of Rio Negro [in South America] there are human re- manas that cannot be referred to any living race of South America, but only to those of Polynesia. Some of the skulls from the Rio Negro are of the Papuan type. Maori stone imple- ments have been discovered at Cuzco in Perú, and at Santiago del Estiro in Argentina; carved wood clubs, en- tirely similar to those of the Marquesas Islands, have also been brought from the ruins of Truxillo in Perú, and from Quillota in Chile, these being preserved in the La Plata Museum, while others have been discovered in Columbia, Ecuador, and other places in Perú. The similarity of some Polynesian monuments with those of Perú is well known...We find Polynesian anthropological ele- ments mixed with the Patagonians, Polynesian culture amongst the Cal- chaqui and oíd Perú vían culture.

(Moreno, Francis P.; "Notes on the Anthropogeography of Argentina," Geographical Journal, 18:576, 1901. As found in: Polynesian Society, Journal, 11:44, 1902.)

AUSTRALIANS FIRST IN THE NEW WORLD?

Just a few years ago, this question would have been dismissed derisively.
The Clovis-First paradigm still reigned then. No longer!

In mid-2003, the science and popular media loudly announced that 33 skulls from Brazil and 22 similar crania from Baja California possessed strong Australian affinities. They were long and nar- row, like those of the people who first occupied Australia 40,000 years ago.
In contrast, the skulls of present-day Native Americana were short—morpho- logically like those of the people of north- east Asia.

It must be added, though, that other long, narrow skulls have been disinter- red in the New World in the past and quickly "forgotten about." One of these anomalous skulls, that of Kennewick Man (on p. 47) has been an exception to this censorship by neglect.

The key publication in the present flurry of articles on potential pre- Clovis arrivals is by R. González-José et al----a team with members from Spain, México, and Argentina, but Lacking any representation from the United States! (Ref. 1)

Did the long-skulled people arrive before the northeastern Asians trekked aeross the Bering Land Bridge. Both groups may have arrived about 12,000 years ago. The dates have yet to be sorted out. Archeologist D.J. Meltzer, at Southern Methodist University, holds to the belief that Siberia alone was the homeland of America's first settlers. (Ref. 2) We shall see!

And what beeame of the long-skulls? Did their colonies just wither away? Or were they assimilated (or annihilated) by the Asians sweeping down from the north?

(Ref. 1. González-José, Rolando, et al; "Craniometric Evidence fo Palaeoamerican Sur vi val in Baja California," Nature, 425:62, 2003. Ref. 2. Bower, B.; "Continental Survivors," Science News, 164: 150, 2003. Ref. 3. Hecht, Jeff; "Long, Narrow Skulls Reveal the Colonisation of America," New Scientist, p. 17, Sep- tember 6, 2003)

Comment. Unaddressed in the above references is the question of how the long-skulled people might have reached the Baja and Brazil—the latter being separated from Pacific arrivals by the formidable Andes.

FARMING AND HUNTING PRACTICE

WHO OR WHAT EXTERMINATED THE PLEISTOCENE MEGAFAUNA?

This question has been debated for decades. The most popular answer blames an influx of humans to North America aeross the Bering land bridge about 12,0 years ago. P. Martin advanced this "blitzkrieg" hypothesis in 1967. The runner-up theory is a catastrophic change in climate. The North American Pleisto- cene megafauna---the mammoths, the mastadons, the giant sloths, etc.------suc- cumbed to one or the other. But which?

The May 9, 2003, issue of Science re- affirms the human blitzkrieg hypothesis citing new evidence. On the other hand, the May 2003 number of Natural History absolves humanity of megafauna overkill and shifts the blame to a resurgence of the Ice Age, also based on new findings. The simultaneity of the trwo authoritative, contradictory articles may be amusing to the anomalist, but it also illustrates how fuzzy is our picture of the timing of the peopling of North America.

First, the key points made in the Science article:

- In the mud layers at four sites in New York, there is a clear-cut progres sion of: (1) megafaunal collapse as seen in fungal spores; (2) spikes in human produced charcoal; and (3) a later blast of lee Age weather.
- The progression (1) to (2) is also seen iri Madagascar, where (3) did not occur at all.
- Megafaunal extinctions in Australia, New Zealand, Oceania, and elsewhere were also coincident with the arrival of human hunters.

On the other side of the controversy, as promulgated in Natural History:

- At 76 North American Clovis sites, only 14 revealed signs of megafauna butehering, and then only of mammoths and mastadons. There were no signs that the Clovis people actively hunted the other 33 species of mega-

fauna that perished at the same time. •The North American megafaunal extinctions coincide with those in Asia and Europe where humans had lived and hunted these animáis for millen- nia without exterminating them. •Finally, the opinión that a "wide- spread environmental event" was the probable cause of the extinctions.

(Kerr, Richard A.; "Megafauna Died from Big Kill, Not Big Chill," Science, 300: 885, 2003. Reebs, Stephan; "Not Guilty," Natural History, 112:16, May 2003)

Comment. A more recent report seems to cast further doubt upon the claim of a major human role in the extinction of megafauna.

(Guthrie, R. Bale; "Rapid Body Size Decline in Alaskan Pleistocene Horses before Extinction," Nature, 426:169, 2003)

COMMERCE AND VOYAGING

WHEN THI EDGES OF THE CONTINENTS WERE NAKED

The aquatic-ape hypothesis may or may not hold water, but modern sonar under- sea imaging and sampling reveal wide swathes of land that are now drowned that could once have been ideal habitat for water-adapted humans.

One of these surveys was condueted offshore of Queen Charlotte Island, Cañada. The surveyors discovered extensive post-glacial landscapes suitable for human use now covered by 150 meters (500 feet) of ocean, but which were exposed 10,000-12,000 years ago.

In situ tree stumps and shellfish-rich paleobeaches are present on these drowned landscapes. A stone tool encrusted with barnacles and bryozoa were recovered from a drowned delta flood plain now 53 m below mean sea level. This is the first tangible evi- dence that the subaerial-broad banks of the western North American Continental Shelf may have been occupied by humans in earliest Holocene and possibly late glacial time.

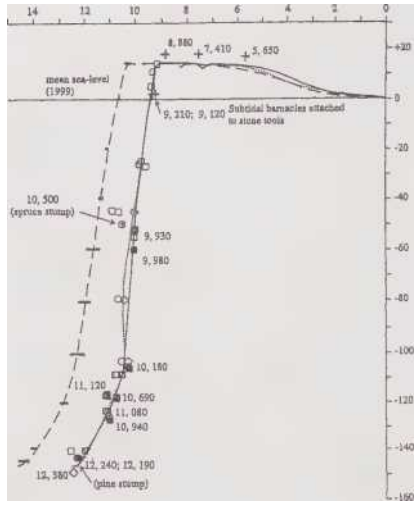
(Fedje, Daryl W., and Josenhans, Heiner; "Drowned Foresta and Archaeology of the Continental Shelf of British Columbia, Cañada," Geology, 28:99, 2000.)

Comment. A map in the referenced report reveáis that 12,000 years ago broad stretches of land several hundred kilometers wide bordered Cañada, Alaska, and Russia. Not only could this exposed land have encouraged entry into the New World (as long-theorized), but the universal 500-foot drop in sea level provides ampie opportunity to speculate about Atlantis and other drowned cities of earlier cultures now lost in time.

One can imagine vast human-occupied plains abutting the steep, exposed edges of today's continents, then fringed with great waterfalls hundreds of feet high as the continents' rivers scoured out the great submarine canyons seen on modern bathymetric maps. There are few, if any, reliable accounts of this segment of human history, although speculation is rife about an Osirian Age, ancient sea kings, and the like.

Finally, one must ask what caused the rapid rise in sea level shown on the graph? Were melting ice sheets sufficient?

MILLENNIA B.P.



Sea-level curves for the British Columbia coast versus time. (Left) dashed curve in calendar years. (Right) Solid curves indicating radiocarbon measurements. A stone knife was recovered from a depth of 53 meters.

AN ICE-AGE NORTH ATLANTIC VOYAGE?

Above, we described one potential Coastal route whereby Asians could have entered North America about 12,000 B.P. The sea level was still low as the Ice Age was waning, and broad exposed plains would have provided safe harbors and, for sustenance, teeming marine life and nearby terrestrial game.

Here, we examine a similar scenario for North Atlantic seafarers cirea 20,000 B.P. There is artifactual justification for this radical hypothesis. The famous Clovis points, which are found in all of the lower 48 states bear similarities to the points manufactured by the Solu- trean culture occupying Spain and Portugal at about this time in human history. But could the Solutreans, not known as skilled mariners, have made it across the North Atlantic in those frigid times?

In fact, an Ice Age Crossing of the Atlantic might not have been as formidable as you would tliink True, there was permanent sea ice blocking the route taken by the Vikings a thousand years ago; that is; Ireland to Iceland to Green- land to Newfoundland. But the Iberian coast was olear and so were Southern Ireland and Britain. And there was also a weak warm current through the summer ice ñoes leading from Ireland to New England'B Grand Banks, which low sea levels had exposed for perhaps a hundreds of miles out into the Atlantic. What's more, the Grand Banks would welcome voyagers with abundant fish and game.

Even the Ice Ages presented an occasional warm summer, and when that happened one can also imagine a direct dash of 1,200 miles from Ireland to the greatly extended Grand Banks, thus avoiding the long, circuitous warm current. Once at the Grand Banks, the way to the East Coast of America was open, and the Solutreans (or possibly their predecessors) could have left their artifacts at the ancient sites at Meadow- croft (Pennsylvania), Cactus Hill (Virginia), and Topper (South Carolina) (pp. 24-25).

(Hardaker, Chris; "Towards Resolving Clovis Origins," Mammoth Trumpet, 16:14, June 2001. Anonymous; "Immigrants from the Other Side," Mammoth Trumpet, 17: 11, December 2001.)

Comments. Based upon the Polynesian and Australian affinities seen in Brazil- ian and Patagonian artifacts and skele- tons, a South Pacific entry to the New World is also on the table.

North Atlantic ice cover circa 20,000 B. P, . Heavy dashes indícate a potential route fringing the ice floes. The longer, lighter dashes represent a probable weak, warm current through the floes; the shorter light dashes show probable coid currents.

WHO NEEDS BOATS?

We don't know why our distant aneestors would forsake the idyllic tropical island of Bali, but some 900,000 years ago they somehow reached Flores, the next Indonesian island in the chain trending to- ward Australia. Sea levels were lower 900,0 years ago, but Flores was still 19 kilometers away. How did our ances- tors cross this water barrier? There is no evidence whatsoever that these homo- nids built boats. How about simple rafts? Possibly, but there is another way. They swam the 19 kilometers (12 miles)! Some modern humans can paddle this far and it seems reasonable that' ancient peoples could, too.

Another water barrier may have been crossed by African swimmers a million or so years ago. Their artifacts are found in Southern Spain. Did they swim across the Strait of Gibraltar rather than trek the long land route through the Middle East and across mountainous Southern Europe?

These possible aquatic feats of our aneestors are not in themselves enough to interest an anomalist but when coupled with another recent discovery they add weight to the fascinating speculation that hominids were once marine mammals----or nearly so.

More important than this recognition of swimming prowess is the recent scut- tling of of the vaunted paradigm that modern humans began evolving when

they split from the forest-dwelling primates and invaded the Afriean savannahs. It now seems that the regions thought to have been savannahs were actually heavily forested when the human Great Leap Forward occurred. Anthropologist P. Tobías now ventures that modera man really began evolving when he escaped the heavy competition from other primates in the forests and took to the sea- coasts. There, in the coastal waters, the "aquatic ape" swam up the evolutionary ladder—toward us!.

Before snorting in derision, reflect upon some of our aquatic features:

- •Compared to the other primates, we are exceptional swimmers.
- •Our babies can float and swim.
- •We are almost hairless like most marine mammals.
- •We are the fattest primates with a layer of subeutaneous fat bonded to our skin, again like most marine mammals.
- •We, alone among terrestrial mammals, have voluntary control of breathing, as do all diving mammals.

(Douglas, Kate; "Taking the Plunge," New SclentisT. p. 28, November 2000.)

Reference. There is mueh more to the "aquatic ape" theory. See.Chapter BHA in our Biological Anomalies: Humans I.

THE AMERICAN DISCOVERY OF EÜROPE!

Wow, that's an inflammatory title, and we must be very wary here. Who could be promoting such an idea? The perpe- trator is J. Forbes, a professor of Native American Studies at the Univer- sity of California-Davis. The title above is, in fact, the title of Forbes' forth- coming book. Forbes recently gave a talk on his thesis in Berkeley, and the evi- dence below is based on a newspaper account of his talk. The account began with:

> It is a common pereeption, and one which is taught in most history clas- ses, that the Europeans "discovered" America. Some scholars, however, postúlate that it may be quite the opposite: Native Americans went across the Atlantic and "found" their European counterparts first.

Now for the claimed evidence:

•Carribean people were the Polynesi- ans of the Americas. Excellent mariners, they built sophisticated sailing vessels 80-feet long, carrying up to 80 people. With the favorable winds and currents, they had the capabilities of reaching Europe. .

•There are tales of "redmen" arriving on the west coast of Portugal during the Middle Ages.

•Columbus himself, during a visit to Ireland, noted the presenee of people resembling North Americans.

•Columbus also made notes on Indians in canoes wrecked off the coast of Ger- many in 1410.

•Inuits (Eskimos) are said to have landed in the Orkneys, off Scotland. Oíd Inuit harpoon heads have been dug up in Ireland and Scotland.

(Kluepfel, Brian; "Native Americans May Have Found Europe, Says Scholar," Berkeley Voice, January 28, 1993. Cr. P.F. Young.)

Comment. Obviously, stronger evidence will be required to convince most archeo- logists. And what about all the purpor- ted claims for early contacts with the Americas by Celts, Phonecians, Hebrews, Romans, Africans, etc,?

AFRICANS IN ANCIENT AMERICA?

We would be remiss if we let slide by unnoticed a major rebuttal to I. Van Sertima's claim that Africans contacted the Americas before the Europeans. We refer, for example, to Van Sertima's book entitled They Carne before Columbus. Specifically, Van Sertima argued for contacts between the Nubians and Olmecs cirea 700 BC. (You will recall those massive Olmec heads that seem to have negroid features.) He also proposes cultural diffusion from Mali about 1300 AD.

Many archeologists have quietly filed Van Sertima's claims with those of B. Fell and E. von Daniken, but this side- stepping of the Afrocentrists' challenges has not been very effective. Now, we have a 12-page broadside from G. Haslip- Viera et al in Current Anthropolgy that vigorously attacks Van Sertima on many counts, four of which follow:

> (1) No genuine African artifact has ever been found in a controlled archaeologieal excavation in the New World.
>
> (2) The presenee of African origin plants, such as the bottle gourd or of African genes in New World cotton, shows that there was contact between the Oíd World and the New, but this contact occurred too long ago to have involved any human ageney and is ir- relevant to Egyptian-Olmec contact.
>
> (3) The colossal Olmec heads, which resemble a stereotypical "Negroid," were carved hundred of years before the arrival of the presumed modela.
>
> (4) Claims for the diffusion of pyra- mid building and mummification are also fallacious.

(Haslip-Viera, Gabriel, et al; "Robbing Native American Cultures," Current Anthropology, 38:419, 1997.)

Comment. But which stance is more "politically correct," the defense of Native American culture (implied in the artiele's title) or Afrocentrism? Some- where, true Science seems to get shoved aside! Whatever anyone says, those Olmec heads certainly appear African!

LANGUAGE ANOMALIES

ANCIENT ROMANS IN TEXAS?

Anomalous language concordances. Pro- fessor V. Belñglio has pointed out many similarities between Latín and a dialect of the now-extinct Karankawas tribe. No comment so far from the language experts on this!

(Lee, Victoria; "Professor Explores Theory of Romans' Ancient Voyage," Dallas Morning News, June 13, 1993. Cr. T. Adams via L. Farish.)

ANTHROPOLOGY ÜNBOOND

At the February 1998 annual meeting of the American Association for the Ad- vancement of Science (AAAS) in Phila- delphia, anthropological heresies ran rampant.

Linguist, J. Nichols, from Berkeley, sees a curious diversity in the languages of New World peoples. Some 140 language families—half the world total—are found in the Americas. Nichols estimates that it would have taken a mínimum of 40,0 years for'such diversifieation. (Again assuming initial homogeneity.)

Nichols also pointed out strong simi- larities in languages all around the Pacific Rim, from New Guinea north to Siberia, around Alaska, and down the west coast of the Americas. The implica- tion is that many of these peoples de- rived from the same stock.

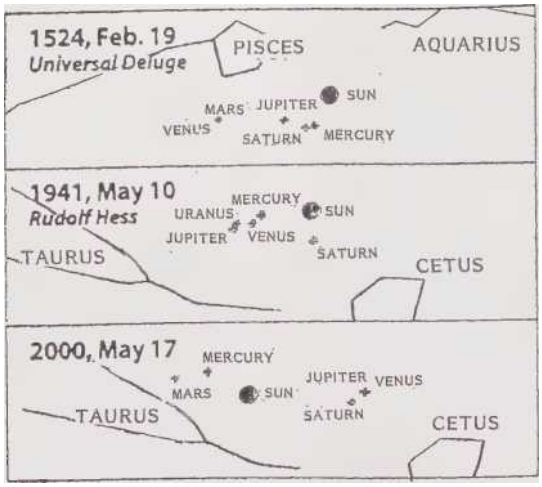
(Lore, David; "Bering Strait May Not Have Been Only Route to Americas," Columbus Dispatch, February 17, 1998. Also: Gibbons, Ann; "Mother Tongues Trace Steps of Earliest Americans," Science, 279:1306, 1998.)

MYTHS, LEGENDS, TRADITIONS

PLANETARY CONJUNCTIONS THAT CHANGED THE WORLD

On May 17, 2000, five solar-system planets (Mercury, Venus, Mars, Júpiter, Satura) plus the moon siowly wheeled into a tight 19i° are. It was a notable heavenly conjunction. All manner of natural catastrophes were predicted but failed to materialize. It has been this way down recorded history. Universal deluges were anticipated during similar conjunctions on September 14, 1186, and February 19, 1524, but the weather refused to cooperate with the planets. Humanity survived nicely.

This does not mean that historical upheavals are never correlated with planetary conjunctions. If a society believes strongly enough in the power of the stars and planets to shape human destiny, events may be correlated with the heavens. Such was the case in ancient China. •



(Bottom) The recent conjunctíon (that wasn't so catastrophic after all) (Above) Two earlier ones. All are shown as they appeared against the backdrop of some well-known constellations.

In China, the "Mándate of Heaven" eoncept has heen used since aneient times as both a framework for history and a guide to future actions. The basic idea is that Heaven awards ruling power to a sage-king because of his virtue. His descendants remain as Earthly deputies until they become corrupted, whereupon outraged Heaven gives signs in the sky that the Mándate has passed on to a different sage-king to continué the eycle.

Three transfers of the Heavenly Mándate marked the beginnings of the Hsu, Shang, and Chou Dynasties. In faet, the tightest grouping of the five visible planets in the period from 3,000 B.C. to 5,0 A.D. (8,000 years!) occurred on February 26, 1953 B.C., when they were aligned in a 4.33° are. This was seen by the Chinese power brokers as a celestial command to begin a new social order. Thus was born the Hsu Dynasty. Similar, but looser, conjunctions ushered in the Shang Dynasty (December 20, 1576 B.C.) and Chou Dynasty (May 28. 1059 B.C.)

So, astrology can influence human destiny, *if* humans believe in it strongly enough.

Astrology almost changed the course of history in modern times. Rudolph Hess, a fervent believer in astrology, took the conjunction of May 10, 1941, as a signal that he should steal a plañe, fly to Eng- land, and try to engineer a peace be- tween Britain and Nazi Germany. He failed. Surely, his astrologers could have told him that he would!

(Schaefer, BradleyE.; "Conjunctions that Changed the World," Sky & Tele- scope, 99:28, May 2000.)

DIFFUSIONi OF PLANTS, AN1MALS, D1SEASES

EVIDENCE OF TOBACCO IN ANCIENT EGYPT

S. Balabanova et al, at the Instituí fur Anthropologie und Humangenetik in Munich, have pulverized and dissolved samples of hair, soft tissue, and bone tissue from seven Egyptian mummies dated between 1070 BC and 395 AD. Chemical analyses detected eocaine, hashish, and nicotine in quantities similar to those found in modern addiets.

(Balabanova, S., et al; "First Identification of Drugs in Egyptian Mummies," Naturwissenschaften, 79:358, 1992. Cr. B. Rudersdorf)

Comment, Presumably, the nicotine was derived from tobáceo. Tobacco is widely believed to be a New World plant. Is this belief incorrect? Could the nicotine have come from another source? Were there contacts with.'the New World be- fore the Vikings and Columbus?

TOBACCO AND COCAINE IN ANCIENT EGYPT

The current Newsletter of the New Eng- land Antiquities Research Association has flagged an important anomaly that appeared on a 1997 TY program.

> **In January [1997] the Discovery Channel broadeast a program stating that cocaine and tobáceo had been found in Egyptian mummies known to be at least 3,000 years oíd. Tests used modern forensic methods and were repeated many times under care- fully controlled conditions. Since coca and tobáceo are not known to have grown anywhere other than the Amerieas, the evidence points to trade routes across the Pacific or Atlantic in those remóte times. The program seemed to favor a Pacific Crossing and then delivery via the Silk Route. Watch for a rebroadeast.**
>
> **This news item continued with a re- ference to Dr. Balabanov's supporting tests on bodies from China, Germany and Austria, spanning the years 3,700 EC to 1100 AD. These bodies contained incredibly high percentages of nicotine.**

(Ross, PrisciHa; NEARA Transit, 9:5, Spring 1997.)

Comment. In vol. 1, p. 48, back in 1978, we reported that the mummy of Rameses II contained anomalous traces of nicotine.

MYSTERY OF THE STONED PHARAOH

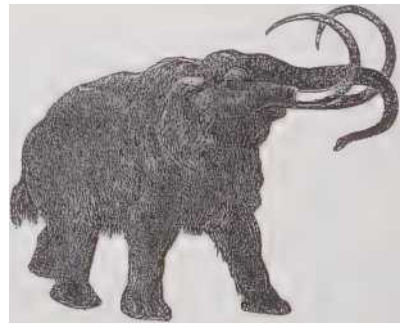
So reads the caption under the photo of an Egyptian sarcophagus in the French magazine Telerama.

The short article accompanying the photograph relates how a respected toxicologist, a Dr. Balanova, has pre- sented "irrefutable" proof that the mummy of the pharaoh Henut Taui contains traces of both cocaine and tobáceo. This pronouneement elicited the comment: "Madame Balanova hallucinates!" The reason for such a reaction is not hard to find. The mainstream position has been that cocaine and tobáceo are New World substances that were unknown in the Oíd World until after 1492. A stoned pharaoh implies trans-Atlantic commerce 2,0 years before Columbus.

(Merigaud, Bernard; "La Cocaine des Pharaons," Telerama, p. 122, September 3, 1997. Cr. C. Maugé.)

DWARF MAMMOTHS IN ANCIENT EGYPT?

Dwarf mammoths may have survived in northeastern Siberia into historical times. (p.125) Given this possibility, B. Rosen wonders whether the aneient Egyptians might have known of them. He points to some evidence that they might have. For example, one scene painted on the tomb of one pharaoh represente tributes brought from afar to Egypt, including a parade of exotie animáis. One of these animáis is an obvious bear. This animal



Dwarf mammoths in aneient Egypt? Actu- ally, these animáis survived at least until 2000 B . C . on Wrangel Jsland in the Arctic and doubtless elsewhere.

would have intrigued the pharaoh be- cause bears and ancient Egyptians did not coexist. Just as exotic to the pharaoh would have been the miniature elephantid following just behind the bear in the painting. It was about the same size as the bear. Since this elephantid was depicted with large tusks, it was definitely not an immature. It also displayed the peculiar domed skull typical of mammoths and which is absent on African elephants. Could it have been a late-surviving dwarf mammoth brought all the way from Siberia?

Of course, there are alternative in- terpretations. Asían elephants do have domed skulls, and the artist could have deliberately drawn the elephantid at a redueed scale. However, other animáis are realistically sized.

(Rosen, Baruch; "Mammoths in Ancient Egypt?" Nature, 369:364, 1994.)

SOMEHOW BANANAS SLIPPED INTO WEST AFRICA 2,500 YEARS AGO

The West African country of Gameroon does have an indigenous species of banana---the red Abyssinian banana—but it is inedible. However, some microscopio silica fossils called "phytoliths" ("plant stones") tell archeologists that Cameroonians were enjoying cultivated bananas 2,500 years ago. The problem is that cultivated bananas viere then sup- posedly flourishing only in distant Asia. Furthermore, cultivated bananas are infertile and can be propagated only by cuttings carried by humans. So, who transported banana cuttings 10,000 miles from, say, Indonesia around the Cape of Good Hope or across the whole African continent 2,500 years ago? And where is the banana trail? There seem to be no traces of ancient phytoliths anywhere in between.

Bananas were being cultivated in Indo- nesia 2,500 B.P., but they didn't reaeh Madagascar until the First Century A.D. East Africa didn’t grow them until the Tenth Century A.D. But there they were in West Africa in 2,500 B.P. There seems to have been some unrecorded ancient sea commerce around the Cape of Good Hope.

(Coghlan, Andy; "Slippery Customer," New Scientist, p. 13, 2001.)

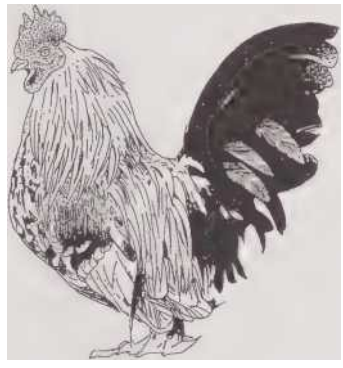
Comment. Of course, this date of 2,500 B.P. ir not inconsistent with the ap- parent use of tobáceo and other New World drugs by early Egyptian pharaohs.

PRE-COLUMBIANA

Pre-Columbiana is the title of a new journal focussing upon evidence for pre- Columbian contacts between the Oíd and New Worlds. Except for the Norse settle- ment at L'Anse aux Meadows, Newfound- land, sueh early visitations are denied by mainstream archeology. Yet, there are hints everywhere that both the Atlantic and Pacific were crossed fre- quently before Columbus set sail.

One class of pre-Columbiana consiste of linguistic, artistic, literary, and fossil evidence that distinctive New World plants were known in the Orient well before 1492. C.L. Johannessen, a geographer at the University of Oregon, demonstrates in a long article that both India and China knew and exploited a surprisingly wide range of American plants. For example, many carvings in Indian temples depict maize, which originated in the New World. A similar situation prevails for the sunflower and a many-seeded New World fruit called "annonas." Sunflowers and maize are also prodigious seed producers, suggest- ing that these three plants were valued as fertility symbols and may not have been eonsumed as food.

The pre-Columbian Pacific was a two- way conduit for plants and even a few animáis. For example, the Oíd World contributed blaek- boned chickens, cotton, and coconuts to the New World.



Chickens made a Precolumbian Crossing of the Pacific to the New World

As for China, Johannessen has gathered evidence for early China- destined Pacific crossings of maize, sunflowers, a squash, chili peppers, sweet potatoes, the yam-bean, and grain amaranths.

Most startling, though, has been the discovery of New World peanuts at two Neolithic sites in eastern China. The associated dates are astounding: 2,400 BC and 4,400 BC. Who was sailing the wide Pacific while the Egyptian pyra- mids and Stonehenge were under con- struction? Supporting the fossil peanuts is a written Chínese record of 300 AD describing a plant that buries its flowers in the soil and makes seeds that rattle when dry. Peanuts are very unusual that they flower above.ground and then burrow into the ground to form nuts----a characteristic one must see to believe and a story hard to fabrícate.

(Johannessen, Cari L.; "American Crop Plants in Asia before A.D. 1500," Pre-Columbiana, 1:9, 1998)

VIKING-INTRODUCED BIOLOGICAL DIVERSITY IN NORTH AMERICA

Common in Maine but rare elsewhere in North America is the so-called "coon cat." This large, handsome cat gets its ñame from its raccoon-like hind quarters and gait. Its bushy tail and oceasional ten- deney to wash its food encouraged the oíd belief that this animal ıs a hybrid of the domestie cat and raccoon. The evolu- tionary distance between these two species is so great that hybridization seems an untenable proposition.

More interesting to anthropologists

This guaranteed sketch of a true Maine coon cat does not reveal any of its defining characteristics: coon-like hindquarters and gait.

is the suggestion that the Vikings brought cats with them when they briefly settled North America about 1,000 years ago. The Yiking domestie cats were Norwegian Forest Cats, also called skaugkatts or wegies. The coon cats were supposedly created when the Viking cats jumped ship or went feral and mated with an unidentified native American feline species that is now extinct.

The pttre Norwegian Forest Cat is larger than our domestie cats, possesses long fur, a slightly different head shape, and straighter hind legs. The latter could contribute to the coon cat's raccoon-like gait. Most impressive is the claim that coon-cat DNA is similar to the DNA of the Norwegian Forest Cat,

Assuming the coon cat did origínate a millennium ago during the Viking pre- sence in North America, one has to wonder if the Vikings settled in Maine and even farther south-----as well as in in Newfoundland. Was Vineland actually in Maine! That’s where the coon cats are common.

(Joseph, Frank; "Viking 'Forest Cat' Discovers America," Ancient American, no. 47, p. 7, 2002.)

Comments. The Encyclopedia Americana, 6:26, 1966, states that the coon cat is actually a variety of Angora brought from Turkey to North America perhaps 150 years ago. .

On the other hand, ,T.W. Higginson examined a coon cat in Taunton, Massa- chusetts, in 1871, that was reputed to be a hybrid between a domestie cat and a pet raccoon. Several litters of the hy- brids were said to have been produced. Higginson's description of the cat's fur and gait left little doubt in his mind that coon- cat hybridization had occurred.

Higginson's report appeared in a prestigious Science journal (American Naturalist, 5:660, 1871). Therefore, we * So,

cannot dismiss it out-of-hand, although we probably should. The Viking story is seconded on the web site of the Cat Fancier's Association.

So, we have three origins offered for the origin of coon cat. Where does the truth reside?

COON CATS CONTINUED

The coon-cat Ítem above evoked several faet-ñlled responses eoncerning this curious breed. Besides the two references Usted below, there are two books devoted to coon cats and several "coon-cat clubs." From all this new Information, it is readily apparent that the coon-cat is most unusual physiologically speaking and much like the large Norwe- gian forest cat or "skogcat" with .its long, waterproof fur and possessing hind legs longer than its forelegs.

The issue raised above concerned the possible introduction of the coon- cat's progenitor to the New World by the Norse some 1,000 years ago. This is not some wild surmise by some diffusionist. This theory of the coon-cat[1] s origin is Number 7 of 12 theories advanced in the Cat World encyclopedia, which adds:

> To believe this, you have to accept the controversial view that Vikings were regularly visiting North America in the 500 years before Columbus "dis- covered" the New World. (It is claim- ed that Columbus was only able to make his voyage successfully because he had set eyes on some of the early Viking maps of North America.)

(Morris, Desmond; Cat World: A Feline Encyclopedia, p. 273. Cr. J. Holden. Osier, Carolyn; "Is That a Cat?" Cat Fancy, p. 23, January 2003. Cr. L.M. Nash.)

COLUMBUS EXONERATED: VIKINGS BLAMED

About 1500 A.D., a major epidemic of syphilis swept across Europe. Up until this time, this continent had been thought to have been free from this dreaded affliction. In the New World, though, archeologists had uncovered many skeletons dated well before 1500 showing unmistakable signs of syphilis. America was obviously the source of this scourge, but how did it ever get to Europe? Of course, every child knows that Columbus sailed the ocean blue in 1492. It seemed pretty certain that Columbus's men and the American aborigines had been very, very friendly.

Actually, about a dozen pre-1500 skeletons displaying hints of the disease had been found in England and Ireland, but they were not eonvincing enough to dethrone the Columbus theory.

Recently, however, several additional syphlitic skeletons were dug up at a medieval friary in northeastern Britain. The earliest of these bones date back to about 1300. In fact, the new evidence suggests that there was a geographically limited mini-epidemic of syphilis in Britain about this time. Columbus was now off the hook, but who should be hung on it instead? The Vikings, of course.

Viking merehants began visiting this part of England about 1300. And it is now admitted that the Vikings had made it to the New World source of the disease circa 1000. Case closed!?

(Malakoff, David; "Columbus, Syphilis, and English Monks," Science. 289:723, 2000.)

Comments. But the Viking contacta with the American aborigines were far from amicable. If some Viking skeletons from this period were to show signs of syphilis , we could blame them more easily. Until then, let's line up some other sus- pects: the Welsh Prince Madoc, the Irish St. Brendan, Earl Henry Sinclair of Orkney, or those Celts and Phoenicians who seem to have left messages on rocks throughout eastern North America.

NEW ZEALAND'S 1200 A.D. BARRIER

This temporal barrier to the human set- tlement of New Zealand was erected by archeologist A. Anderson. He had re- viewed all available radiocarbon dates and had concluded that all signs of human settlement earlier than 800 years ago are highly suspect. This is all remi- niscent of the New World's notorious Clovis Limit to human entry set at 12,000 years and firmly enforced until recently. Like it, Anderson's 1200 A.D, barrier is now under heavy assault.

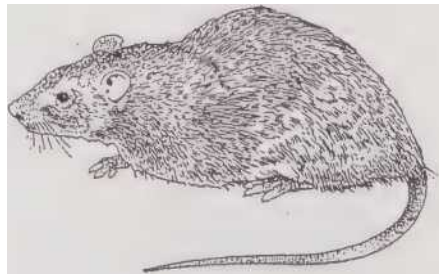
Maori legends relate how they reached New Zealand in several "fleets" or "canoes" between 950 and 1350 A.D. But Maori oral history also speaks of finding _ New Zealand already inhabited by ano- ther group of people. However, establish- ment archeologists assert firmly that no traces of pre-Maori contacta have ever been found.

In 1988, D. Sutton tried to push the date of the first visit to New Zealand back to about 250 A.D. based upon en- vironmental evidence. He pointed to traces of large fíres that could have been ignited only by humans. The 1200- A.D. barrier didn't budge on this evidence .

A scientific bombshell burst in 1996 when R. Holdaway presented radiocarbon dates for bones of the Pacific rat that went back 2,000 years. Since the Pacific rat is not a New Zealand native and is not a star swimmer, it must have had human help in getting to isolated New Zealand, just as it has gained footholds on most other islands in Oceania by tag- ging along with humans. This rat and its human transporters must, therefore, have long preceded the Maoris, or so goes the claim.

Most archeologists, however, are holding to the 1200 A.D. barrier. They would like to see ancient human bones and artifacts. Why be politically incor- rect without better evidence?

(Powell, Eric A.; "Searching for the First New Zealanders," Arehaeology, 56:41, March/April 2003.)



The Pacific rat landed in New Zealand 2,0 years ago, centuries before the Maoris arrived. How did it get there1 Pre-Maori peoples?

Comments. Powell's article does not men- tion the Moriori people, who figure strongly in fringe speculations about pre-Maori New Zealand history. But the Moriori people, according to mainstream archeology, were eonfined to the Chatham Islands far southeast of New Zealand.

Also not mentioned is the claim that some 2,000 pre-Maori structures exist in the Waipoua Forest in Northland. See pp. 21-22 for details.

Powell does, though, state outright that Polynesian voyagers did sail all the way to South America. There, they acquired kumara, a species of sweet potato that is now a staple throughout Oceania.

A COLD BARRIER TO INTERNAD PARASITES

It was once believed that Oíd World human internal parasites first arrived in the New World with Columbus. However, studies of Precolumbian burials have proven that the indigenous peoples of the Americas had already been afflicted with all manner of hookworms, hairworms, giant roundworms, and related disgusting internal inhabitants The problem arising is that some of these Pre-Columbian New World para sites are strictly tropical species. It is most unlikely that those invaders from Asia Crossing the coid Bering land bridge
12,0 years ago would have carried these tropical species in their viscera. Rather, these warm-climate parasites probably carne by boat from portB located in lower latitudes, such as Southeast Asia, Africa, or the Mediterranean.

(Jett, Stephen; "Pre-Columbian Trans- Oceanic Contacte: The Present State of the Evidence," NEARA Journal, 36:4, Winter 2003) NEARA = New England Antiquities Research Association.

Comment. Jett's article also summarizes the evidence for Pre-Columbian diffusion from studies in human geneti.es, the dis- tribution of cultivated plants, languages, and ancient inscriptions. It's a voluminous and impressive dossier.

SCIENCE AND TECHNOLOGY

ARCHEOMETEOROLOGY

Ancient farmers the world over counted off the seasons and fixed planting times by watching the stars and the sun. But the stars can also help forecast the weather, even though they have no in- fluence over it. We'll cali this unique sort of archeoastronomy: "archeometeoro- logy."

Farmer-astronomers in the drought- prone regions of the Andes learned how, after what must have been centuries of sky- watching, to wring rainfall predic- tions from observations of the Pleiades. This information allowed them to better time the planting of potatoes—their most important crop.

The astronomical phenomenon they employed is far from obvious. The Pleiades are a cluster of bright stars in the constellation Taurus. The visibility of

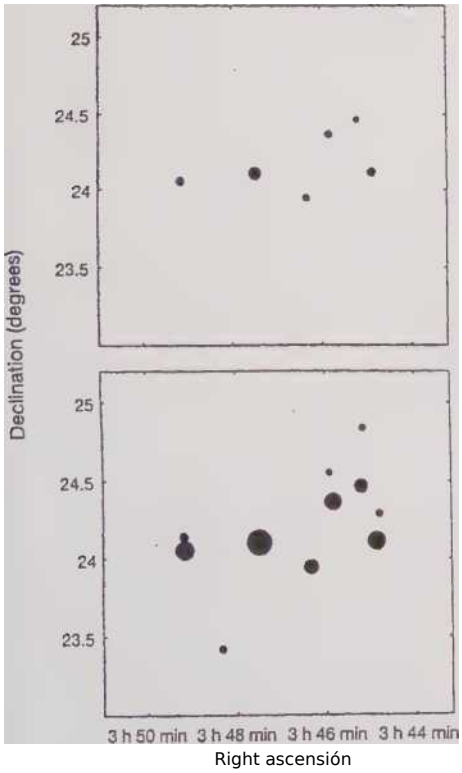
these stars varíes slightly depending upon the amount of subvisual cirrus. If the Pleiades were dull in the month of. June, the Andean farmers knew from ex- perience that an El Niño was on the way. This betokened redueed rainfall and told them to postpone the planting of their potato'es by 4-6 weeks for best yields.

The critical observations were made between June 13 and 24, wlien the Pleiades shine brightly just before dawn over the northeastern horizon. At this low angle, the presenee of the subvisual cirrus has an obvious effect on the brightness of the stars in the cluster, as indicated in the figure. Some of the lesser stars seem to disappear altogether.

The visibility effect itself is rather subtle. It is remarkable enough that it was noticed at all by ancient peoples, much more so was their making the obscure connection to future weather.

(Orlove, Benjamín S., et al; "Forecasting Andean Rainfall and Crop Yield from the Influence of El Niño on Pleiades Visibility," Nature, 403:68, 2000.)

Comment. To the ancients, the Pleiades were known as the "seven sisters," be- cause their eyes registered seven re- splendent stars. But today a naked-eye observer counts just six. What happened to the "Lost Pleiad?" Apparently it faded away in historical times. Details in Section AOF28 in Stars, Galaxies, Cosmos.



Right ascensión

(Top) Even with hazy viewing, the six brightest Pleiads are usually visible. (Bottom) With good seeing more of them come into view.

SKEWERING SOME MORE PARADIGMS

The prehistory of the human race is in upheaval. By the time you read this, much will have changed. We can do little about this, but we can show how some long-held theories are being com- promised by new discoveries. Here are two paradigms being challenged.

Paradigm #1. Homo erectus, the sup- posed predecessor of ourselves and the Neanderthals, was even more primitive and unsophisticated than the loutish Neanderthals.

Paradigm #2. Protohumans oceupying [1] Europe more than 40,000 years ago were unable to kill large prey and relied for their suppers upon scavenged carcasses and those small animáis they could trap.

But, in February 1997, Germán scien- tists reported they had discovered three excellently preserved wooden spears in a stratum 400,000 years oíd. Butchered horses nearby imply the systematic hunting of large animáis. Sueh skills involved foresight, organization, and collective action. Thus, the date of Paradigm #2 is off by a full order of magnitude. As for Paradigm #1, R. Den- nell, from the Dniversity of Sheffield, demolishes it in these words:

> The spears have other exciting impli- cations...We see considerable depth of planning, sophistication of design, and patience in carving the wood, all of which have been attributed only to modern humans.

Mainstream thinking states that only Homo erectus roamed Europe 400,000 years ago. However, some anthropolo- gists, such as M.B. Roberts, lean to- ward an archaic versión of H. sapiens; that is, our species.

(Anonymous; "Ancient Spears Revise Thinking on Early Humans," Baltimore Sun, February 27, 1997. The key re- port is: Thieme, Harmut; "Lower Palaeo- lithic Hunting Spears from Germany," Nature, 385:807, 1997. Bower, B.; "Germán Mine Yields Ancient Hunting Spears," Science News, 151:134, 1997.)

Comment. Homo erectus is springing surprises on paleoanthropologists. Re- mains only 27,000 years oíd have turned up in Java —at least 250,000 years after the demise of H. erectus on the Asían mainland. H. erectus could well have coexisted with modern man.

(Swisher, C.C., III, et al; "Latest Homo erectus of Java: Potential Contemporane- ity with Homo sapiens in Southeast Asia," Science, 274:1870, 1996.)

Final comment. Could H. erectus still survive in the Himalayas? Elsewhere?

ACÜPDNCTÜRE 5,200 YEARS AGO?

The Tyrolean Iceman died in the Alps _ about 5,200 years ago, but his mummified body is exceptionally well-preserved so well- preserved that 15 groups of ^ tattoo marks on his body stand out vivid- ly. These punctures do not seem to be ornamental, like those on a sailor s bi- ceps, ñor are they on parts of the body usually displayed. What is most interest- ing are their locations; some groups are placed at traditional Chínese acupunc- ture points. Bolstering this suspicion is the determination from Computer tomo- graphy (noninvasive imaging) that the Iceman suffered from arthrosis of the lumbar spine. The Iceman's body is punctured at the points usually used by acupuncturists to treat this condition!

> These findings raise the- possibility that the practice of therapeutically intended acupuncture originated long before the medical tradition of ancient China (approximately 1000 B.C.) and that its geographical origins were Eurasian rather than East-Asian, con- sistent with far-reaching intercultural contacta of prehistoria mankind.

(Dorfer, Leopold, et al; "5200-Year-Old Acupuncture in Central Europe?" Science, 282:242, 1998.)

NATURAL CATASTROPHES

A NUCLEAR CATASTROPHE IN PALEOINDIAN TIMES?

Introduction. We introduce here a re- markable theory of terrestrial catastro- phism that seems to be supported by evidence that is equally remarkable. One of the authors of this theory (RBF) is identified as a nuclear scientist at the Lawrence Berkeley Nuclear Laboratory. The second author (WT) is a consultant. The authors' credentials seem so good that we must take a cióse look at their extraordinary claims conceming a natural phenomeon that they believe reset radiocarbon docks in north- central North America and—potentially ----------else where on the planet. We will be most interested in the reception accorded these claims by the scientific community.

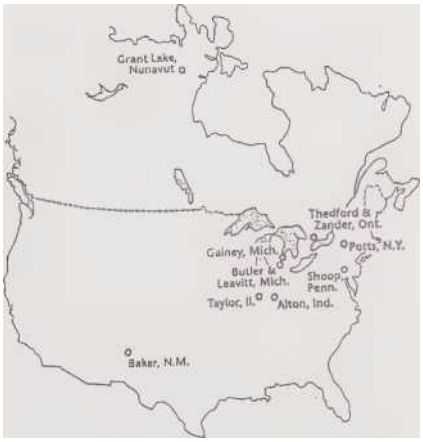
The claims. In the authors' words:

> Our research indicates that the entire Great Lakes región (and beyond) was subjected to particle bombardment and a catastrophic nuclear irradiation that produced secondary thermal neu- trons from cosmic ray interactions.
> The neutrons produced unusually large quantities of ^{239}Pu and substan- tially altered the natural uranium abundances (^{233}U/$^{23°}$U) in artifacts and in other exposed materials in- cluding cherts, sedimenta, and the entire landscape. These neutrons necessarily transmuted residual nitro- gen (^{14}N) in the dated charcoals to radiocarbon, thus explaining anoma- lous dates.

Some North American dates may in consequence be as much as 10,000 years too young. So, we are not dealing with a trivial phenomenon!

Supporting evidence. Four main cate- gories of supporting evidence are claimed and presented in varying de- grees of detall.

•Anomalously young radiocarbon dates in north-central North America. Example: the Gainey site in Michigan.



Sites in the región purported to have been zapped by a burst of neutrons circa 12,500 B . P .

«Physical eviden.ee of partióle bombardment. Example: chert artifaets with high densities of particle-entrance wounds.

•Anomalous uranium and plutonium abundance ratios in the affected area.

•Tree-ring and marine sediment data.

The authors claim that the burst of radiation from a nearby supernova, circa 12,500 years ago, not only reset radiocarbon docks but also heated the planet's atmosphere, melted ice sheets, and led to biological extinctions.

If verified, the claimed phenomenon would also "reset" archeological models of the settlement of North and South America. To illustrate, we may have to add as many as 10,000 years to site dates in much of North America!

(Firestone, Richard B., and Topping, William; "Terrestrial Evidence of a Nuclear Catastrophe in Paleoindian Times," The Mammoth Trumpet, 16:9, March 2001. Cr. C. Davant III. This off-mainstream journal is published by the Center for the Study of the First Americans..)

Comment. Thus we add another potential cause of an often-hypothesized, 12,500- BP catastrophe that is said to have changed the world's history. Competing theories involve asteroid impact, volcan- ism, a Venusian side-swipe, etc.

See below for a critique of this radical theory.

HOW BAD WAS THAT NUCLEAR CATASTROPHE OF 12,500 BP?

Above, we reviewed at length a long article by R. Firestone and W. Topping in the Mammoth Trumpet, published by the Center for the Study of the First Americans. The article claimed that a catastrophic burst of radiation from a nearby supernova, circa 12,500 BP, reset radiocarbon docks in the Great Lakes región of North America. Radioearbon dates from this area could, therefore be 10,000 years too young!

Responsibly, the Mammoth Trumpet has printed a critique of the Firestone-Topping article plus their response. Summarizing, Firestone and Topping now agree that new evidence does not support a neutrón bombardment of the magnrtude they hypothesized. They add:

> Nevetheless, the cosmogerdc isotope record, coupled with recent astronomical observations, provides direct evidence for the likely influence of nearby supernovae on radiocarbon dates at Paleoindian sites.

(Southon, John R., and Taylor, R.E.; "Brief Comments on 'Terrestrial Evidence of a Nuclear catastrophe in Paleoindian Times'," Mammoth Trumpet, 17:14, March 2002.)

FUSED ANCIENT GARBAGE DDMPS

Víhen a geologist discovers naturally formed glasses, he can explain them in several ways. When an areheologist finds the contente of ancient garbage dumps ("middens") fused into a glassy slag. he has to ponder a bit longer. First, a bit of background.

Natural glasses can be created in several ways. Impact-heating by meteor- ites or asteroids probably fused the famous slabs of Libyan Desert Glass and also the Darwin glass found in Australia. More curious are the peculiar glassy clinkers of fused wood ash found in hol- low snags in trees after intense forest fires. This is called "combustión meta- morphism." Combustión metamorphism is also common where undergound coal seams have caught fire and burn for deeades.

Humans get into the act, too. The ancient Scots piled up trees around their rock forts and fused the stones together with fire. (Why they bothered is un- known.)

However, a different sort of natural glass has been found in east-central Botswana. There, archeologists have found 5-inch-thick layers of glassy slag interleaved with ashy soil in ancient middens (garbage dumps). These middens are not associated with pottery kilns or iron smelting. It is hard to imagine what could have melted layers of garbage, including pottery, plant material, and other biomass. Analysis of the slag indicates that temperatures of 1155-1290° C were required to fuse the garbage. Open fires could not have attained the neces- sary temperature. The slag layers en- compass several hundred square meters, so the phenomenon is not a trivial one.

Combustión metamorphism may be the answer to this puzzle. Lightning or grass fires might have ignited buried biomass layers. Being confined like bur- ning coal seams, the fires could have generated the required very high temperatures .

(Thy, P., et al; "Implications of Prehistoria Glassy Biomass Slag from East- Central Botswana," Journal of Archaeo- logical Science, 22:629, 1995.)

Comments. It is unlikely that lightning would strike the same middens repeated- ly to create the sepárate layers of slag. It would be difficult for grass fires to ignite buried material. But many modern garbage dumps do catch fire and burn for years under the surfaee. We wonder if glassy slag is forming in them.

Chapter 2

ASTRONOMY

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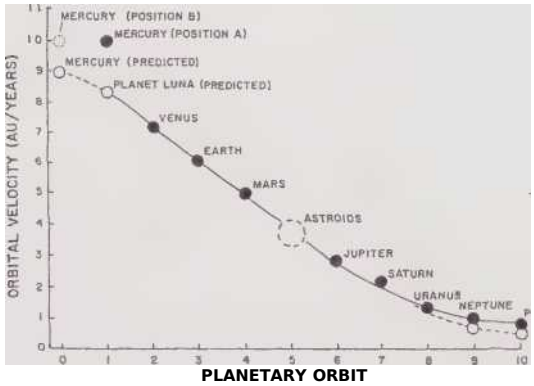
PLANETS AND MOONS

MERCUR

!n vol. 1 (p. 53), one Mercury Ítem is titled: "Mercury: the Impossible Planet." In fact, one can see Mercury's anomalousness immediately from the accompanying plot of planet orbital velocities. Its position sticks out like the proverbial sore thumb. Its orbit is also highly eccentric compared to the other planets. Mercury's heavily cratered surface makes it look like our moon when viewed by satellite cameras, but its high density (5.44) is hardly moon-like (3.34). An even greater surprise is Mercury's intrinsic magnetic field.

We now add several more anomalies to the long list associated with this "impossible" planet.



PLANETARY ORBIT

This ffraph of planetary orbital velocities illustrates how far present-day Mercury (solid circle) is from the general trend. The fit is better if Mercury ivas formed along with the planet Luna at the "pre- dicted" positions. In this scheme, the earth captured Luna in subsequent solar- system upheavals and Mercury moved to its present position.

MERCURY: MAGNETIC AND SINISTRAL

It is a small planet toaked and seared through its proximity to the sun. It's also hard to see through the telescope. Consequently, most astronomers pay it little attention. This is unfortunate because it is a highly anomalous mí mber of the Solar System. In fact, it might even be an interloper from somewhere else.

Mercury's orbit is the most eccentric of all the legitímate planets. (Pluto's orbit is more eccentric, but few count Pluto as a bona fide planet these days.) Mercury is also very dense, so much so that it must have a lar ge, hard-to-ex- plain, iron core. Evidence for water and ice also existe despite the heat of the nearby sun. (See below.) But more perplexing is Mercury's magnetic field.

The planet's presumed iron core is consistent with the dynamo theory of how planetary magnetic fields are generated. But a paradox arises when Mercury's small size is considered. It sliould have lost any residual heat-of-formation long ago. Its postulated iron core should be frozen and incap able of dynamo action.

Some speculate that Mercury is actually a recent interloper of the Solar System that was captured by the sun. It could, in this view, be young and still hot internally.

(Armstrong, John; "Forgotten Planet," Astronomy, 30:40, October 2002.)

Comment. Or, Mercury might have nuclear fission reactor in its core, as discussed for earth on p. 214.

A Southpaw Planet. Now for Mercury's smistral aspect. A largely ignored astronomical mystery is the fact that the sunlight reflected from the surface of Mercury reveáis that the molecules making up the surface minerals are strongly left-handed; that is, sinistral. Most mineral molecules can be either right- or left-handed, and a 50:50 split is the case here on earth. No so, on Mercury and, perhaps very significantly, not so either with terrestrial biological molecules, which are almost always left-handed. One has to stretch far to grasp a plausible connection between Mercury's minerals and earth biochemistry.

(Anonymous; "Sinister Parallels," p. 33, New Scientist, September 28, 2002.)

Comment. In some meteorites containing organic molecules, such as the Murchison meteorite, these molecules do show a definite twist to the left. (p. 193)

SOLAR-SYSTEM PUZZLES: MERCURY

In the 30-or-so years that space probes have been visiting the solar system's other planets, much has been learned, but there are now more questions than ever. Here is one concerning Mercury and the currently accepted answer.

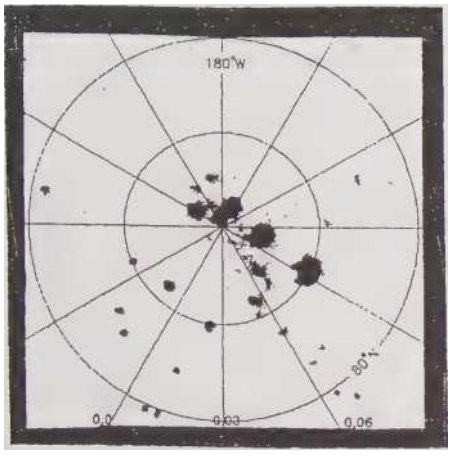
Question. "Why does Mercury have an iron core twice as massive, relative to its size, as any other rocky planet?"

Answer. Probably because a giant impact tore off its rocky mantle.
(Kerr, Richard A.; "The Solar System's New Diversity," Science, 265:1360, 1994.)

SNOWBALLS IN HELL?

In vol. 1, p. 54, we revealed that anomalous radar refleetions from Mercury's polar regions might be due to residual deposits of water ice. At first, this possibility seems most unlikely given Mercury's proximity to the sun. Where the sun's rays beat directly on Mercury's surface, the temperature can reach 700°K, Even glancing sunlight, occurring when the sunis perched on Mercury's horizon, should heat the sur- face to 170°K. At this temperature, water ice would evapórate quickly in Mercury's near-vacuum atmosphere. But any permanently shaded areas at the planet's polar caps—say, deep in a cráter—would remain below 100°K.
This is coid enough to retain ice, even in a vacuum.

Radar topographic studies of Mercury's polar regions, using the Jet Propulsión Laboratory's Goldstone an- tenna with the VEA (Very Large Array) plus the big Arecibo antenna in Puerto Rico, have been able to confirm that there are indeed craters in the polar regions of Mercury. These craters match up well with the radar reflectivity anomalies recorded earlier. So, it now



A radar image of Mercury's narth pole received at the Arecibo observatory. Same of the craters potentially contain water ice.

seems likely that ice does exist on Mer- cury. And, since our moon also boasts permanently shadowed cráter areas, ice probably survives there, too. This is good news for future lunar colonists.

But where could the ice on Mercury and the moon have come from? One source might have been the-gases seep- ing out from the bodies' interiors. Also, cometary impacts could have added water vapor to the atmospheres. This would then have been deposited as frost in coid cráter bottoms, just like the frost seen on winter window panes.

(Harmon, J.K., et al; "Radar Mapping of Mercury's Polar Anomalies," Nature, 369:213, 1994.)

Comment. But were cometa really the sources of residual ice on Mercury and perhaps, the moon. See p. 243 for "icy minicomets."

BYE-BYE MERCURY, AND MAYBE MARS, TOO

During the 1950s, the campaign of main- stream Science to discredit Velikovsky assured the public that the solar system was the epitome of stability------wayward planets were impossible. Then along carne chaos theory which implied that the flight of a butterfly in Brazil could, in principie, affect weather in Cañada. In effect, a slight change in initial condi- tions could, in the fullness of time, have very lar ge effects. Now, it is generally admitted that the solar system is chaotic after all. Each planet is sub- ject to the tiny, butterfly-like gravita- tional tugs of the other planets, especi- ally Júpiter. Given enough time, these gravitational nuances can result in the ejection of a planet from the solar system —and may already have done so in the past!

Mercury and Mars are the most vul- nerable on a billion-year time scale. In the case of Mercury, its orbit will be- come more and more elliptical according to Computer simulations. EventuaUy a cióse gravitational encounter with Venus is possible. This could send Mercury careening off into deep space. The pro- bability of this happening is only 1 in a 1000 over 5 billion years, but it is not zero.

Mars might likewise be ejected by a passing nudge from earth. However, this encounter could go the other way. Depending upon the celestial dynamics of the encounter, Mars might gravitationally fling earth out into the Galaxy, and our planet would truly become "Spaceship Earth."

(Frank, Adam; "Crack in the Clockwork," Astronomy, 26:54, May 1998.)

Comment. The Computer simulations used in the foregoing study have to assume that we now know all the forces acting in the solar system. This may not be the case, as all anomalists and most astronomers well know.

VENUS

~~Venus is often called earth's "sister" planet because of its similar size. Due to its thick cloud cover, little is known about its surface and con- stitution. The anomalies we report below deal mainly with its changing appearance through terrestrial telescopes.~~

THE METAL-FROSTED MOUNTAINS OF VENUS!

Venus is a very hot planet with a mean surface temperature of 740°K. It is so hot there that some metal compounds of chlorine, fluorine, and sulfur are vapor- ized in some locales. Such metallic "mists" could weU coat out as "frost" on the cooler, higher elevations. Actually, two outstanding Venusian anomalies can be explained by such metallic "frosts."

(1) Radar signáis from earth are strongly reflected from the planet's mountains and high plateaus. These regions may owe their unusually high reflectance to metallic "frosts" consis- ting of such radar-bright minerals as pyrite, which is probably present in vapor form at lower, hotter elevations.

(2) During the 1978 Pioneer-Venus mission, four instrumented probes plung- ed into the Venusian atmosphere. All instruments with external sensors on all four probes failed mysteriously 12.5 kilometers above the planet's surface. Thinking is that the probes pierced a cloud deck of metallic vapor that con- densed on the coid sensor surfaces.

(Anonymous; "Metal 'Frost' on Venus?" Sky and Telescope, 90:13, August 1995)

VENUS: TELESCOPIO SHAPE-SHIFTER

Those who watch Venus through the telescope---mostly amateurs these days ----observe frequent "irregularities" along its "terminator," that supposedly sharp, olean line separating the part of Venus illuminated by the sun from that in the shade. This line and the northern and Southern cusps are highly variable. Why? This is an unanswered question.

Three such irregular appearances of Venus were drawn in a recent issue of the Journal of the British Astronomical Association. We reproduce one here.

(Baum, Richard; "Unusual Appearances on Venus," British Astronomical Association, Journal, 110:172, 2000.)

A recent sketch of Venus showing some of the unexplained irregularities in its terminator—the supposedly straight line separating the dark and sunlít hemi- spheres.

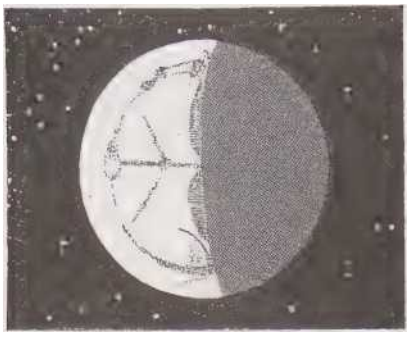
THE ASHEN LIGHT OF VENUS

On occasion, the night side of Venus (which goes through phases like the moon) seems to glow softly and subtly. For some 350 years, keen-eyed observers have seen this phenomenon through their telescopes. Nevertheless, the effect is so elusive that many astronomers doubt its physical reality. Additionally, it is easy to doubt the existence of the ashen light because good explanations are as elusive as the light itself.

During the past decade, two scientific nails have also been driven into the ashen- light coffin:

(1) Spectrographic studies of the up- per atmosphere of Venus do detect some nighttime air glow, but it is much too weak to account for the abundant telescopio observations from earth.

(2) The Cassini spacecraft did not detect any high-frequency radio noise typical of lightning when it passed cióse to Venus in 1998 and 1999. This put an



An 1897 sketch of Venus as seen through a telescope. The left hemisphere dis- plays the spoke-system sometimes seen; the riffht hemisphere is bathed in the so-called "ashen light." (See our cata- log The Moon and the Planets for de- tails of the spoke-system.)

end to the surmise that the ashen light was due to rapid, widespread lightning occurring deep inside the planet's thick atmosphere and then blended into a steady glow by atmospheric scattering.

(Anonymous; "Case for 'Ashen Light' Weakens," Sky & Telescope, 101:27, May 2001.)

Comment. It seems that the ashen-light phenomenon is within an Angstrom Unit of being closed; first, because instru- ments cannot deteet what the human eye sees; and second, and more important, Science knows of no physical mechanism that might create the light. This latter attitude is dangerous. For example, the reality of continental drift was dis- missed contemptuously for decades for the lack of a physical mechanism to move the continents. For a collection of ashen-light reports, see our catalog The Moon and the Planets.

THE EARTH

Most of the earth's anomalies are to be found in the Geology and Geo- physics chapters. Those introduced below are of an astronomical nature; that is, our planet's orbit and axial inclination.

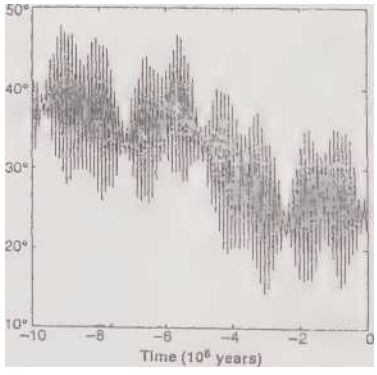
THE EARTH: A DOUBLY CHARMED PLANET

In vol. 1, p. 73, we learned that the evolution of advanced life forms on earth may have depended upon the protective influences of Júpiter and Saturn. These two giant planets can gravitationally deflect potentially devastating asteroids and comets away from the earth.

It seems now that we are doubly lucky! Computer runs demónstrate that the presence of our large moon has stabilized the earth's spin axis down the eons. Presently, the earth's spin axis makes an angle of 23.5° with the plañe of the earth's orbit (its "obliquity") . The well-known result is our yearly procession of seasons. Without the steadying effect of the moon, how- ever, the earth's obliquity would proba- bly have swung chaotically over much larger valúes. Such extreme changes would have been inimical to the develop- ment of life, particularly advanced life.

As a case in point, the polar axis of Mars, with only two tiny moons to damp- en its spin excursions, seems to have gone through many wild swings, as indi- cated in the figure. What deadly climatic changes must have wracked our sister planet!

(Touma, Jihad, and Wisdom, Jack; "The Chaotic Obliquity of Mars," Science, 259:1294, 1993. Laskar, J., and Robutel, P.; "The Chaotic Obliquity of the Planets," Nature, 361:608, 1993)



The obliquity of Mars (the ordinate) over the past 10 million years reveáis chaotic behavior as well as a relatively abrupt transition about 4 million years ago. (From: Touma and Wisdom)

Comment. The successful evolution of higher life on earth (a presumption!) therefore seems to have depended upon the gravitational shields of Júpiter and Saturn as well as the presence of our unusually large satellite. How likely is this combination of planets and satellites in the rest of the universe? Of course, life-as-we-know-it also requires just the right kind of central star and a planet with good air and water. Perhaps life- as-we-do-not-know-It is more likely!

DNSTABLE EARTH?

We all know that the earth's spin axis precesses, giving us the 26,000-year precession of the equinoxes. There is also that Chandler wobble of 14 month's length. These phenomena are accepted by Science. Australian geologist, P.M. James terms them "politically correct" to sepárate them from motions of the earth- as-a-whole that are not digestible by most scientists. James, an obvious icono- clast, is just the right person to sug- gest that in histórica! times the earth has not been as rotationally stable as is generally assumed in scientific cireles.

James asserts that records of ancient total solar eclipses imply large depar- tures from stability. He mentions five such maverick eclipses.

Time	Place	Ob server
05-05-585 BC	Athens	Herodotus
08-05-431 BC	Athens	Thucydides
11-11-129 BC	Hellespont	
04-15-136 BC	Babylon	Plutarch
03-20-71 AD	Chaeronia	

The dates of these five eclipses are not at issue; back-calculations confirm them. However, these eclipses should not have been observable where reported. For example, the path-of-totality for the 136-BC eclipse should have been 4000 kilometers west of Babylon!

Today' s astronomers have no choice but to discard these data as erroneous. Yet, it is hard to be wrong about where one observes a total solar eclipse, and here we have five errors in location. Furthermore, mixed in with the oíd eclipse records are well-behaved ones in 763 BC, 240 BC, and 195 BC; all seen where our back-calculations say they were visible.

James wonders if the earth may have wobbled chaotically in the past. Such motion could account for the many flood myths and allusions to high sea levels.

(James, Peter M.; "Political Correctness in Science," New Concepts in Global Tectónica, no. 19, June 2001)

GREENWICH LATE TIME

When J. Brink recently visited the Oíd Greenwich Observatory, in England, he saw a flag hanging on the building giving the longitude of the site, which by definition is 0° 0' 0". The flag also announced that: "The Next Millennium Starts Here."

Why is this assertion in error? Actually, all days (and miUennia) begin not at Greenwich but at the International Date Line, longitude 180°.

(Brink, Johan; "Greenwich Late Time," New Scientist, p. 59, October 19, 1996)

THE MOON

Astronomers have lavished mora telescope time on the moon than any other object in the night sky. This is understandable because of the moon's proximity which makes it a spectacular object on a clear night. This concentration of observer attention means we know a lot about the moon. However, we do not know everything; there exists a wide array of lunar anomaiies; some fundamental and relating to the earth's origin, others that are simply curiosities

In Volume I, we devoted. considerable space to lunar geology: the non-random cráter distribution, the swirl patterns, the magcons (magnetic concentrations), and the like. Of course, the TLPs (Transient Lunar Phenomena) were not ignored. In fact, during the last decade (1993-2004), we have collected even more fascinating observations of these elusive and controversia! events. Actuaily, TLPs are the central subject in this second volume of current anomaiies. The generally accepted theory of how the moon originated has changed during our last collection period, and we deal with that first. Finally, after all the TLPs, we add some miscellaneous, but not trivial, subjects, súch as the lunar twilight glow.

•Chanqinq Hypotheses about the Moon's Origin. The mainstream view seems to have settled on a specific theory, one rarely mentioned in previous years.

•TLPs. Light flashes, glows, color changes, and a claim that all these are illusory.

•Lunar Miscellany. Horizon glows, cráter chains, etc.

CHANGING HYPOTHESES ABOUT THE MOON'S ORIGIN

IRON-CLAD PROOF OF THE MOON'S ORIGIN?

Did earth and moon "co-create" at the same time? That is, did two clouds of debris simultaneously collect and co- alesce into two rough spheres, which then began orbiting about a common center of gravity? Or, perhaps the earth and moon were once a single mass that ultimately fissioned due to the gravitational tugging of a passing massive object? If either of these scenarios were correct, earth and moon would have similar bulk compositions. This, however, does not seem to be the case.

The abundance and distribution of iron on the moon's surface, as measured by the lunar probe Clementine, indicates that the moon is richer than the earth in refractory (high-melting-point) com~ pounds. The moon, therefore, almost certainly originated elsewhere, contrary to what most astronomers have long- believed.

Given the constraints of celestial mechanics, the most likely hypothesis postulates a colossal impact involving proto-earth and the interloping proto- moon. After considerable havoc, the two battered spheres settled down into their present configurations.

Thus expire the two most popular theories of the moon's origin.

(Lucey, Paul G., et al; "Abundance and Distribution of Iron on the Moon," Science, 268:1150, 1995)

Comment. The above paper and thinking are from 1995. Today (2004), most astronomical bets are a lunar origin involving a collision of early earth with a planet- size body that tore off some les s-dense crustal material from the earth that then coalesced in orbit into the moon.

TLP'S: TRANSIENT LUNAR PHENOMENA

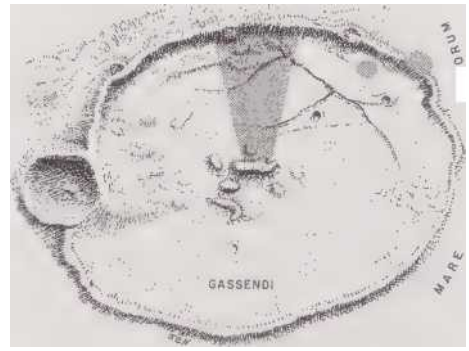
LUNAR LANDSLIDE LIGHTS

Moonwatchers have reported light flashes, strange red glows, and mist-like patches emanating from certain lunar locales, particularly the huge craters Alphonso and Picard. Hundreds of such observations have accumulated since the Middle Ages. Modern more-systematic scrutiny indeed confirms that the moon is not such a dead place after all.

Moonquakes, gaseous emissions, and even volcanic activity have been the favorite explanations of these TLPs (Transient Lunar Phenomena), but these are only surmises.

The many close-up photos of the lunar surface taken in 1994 by the lunar satellite Clementine gave B. Buratti, K. . Herkenhoff, and T. McConnochie the opportunity to search for geological common denominators eonnecting the sites where TLPs have been most frequent. The suspicious sites are characterized by bluish spectra that usually indicate unusually fresh deposite of lunar debrís. Furthermore, these ¿reas are usually found along the inside edges of large craters. Buratti et al opine that these are the sites of recent landslides that have caseaded off the cráter edges. The dust and volatile gases released by these events might account for the observed luminous phenomena.

(Cowen, Ron; "Explaining a Lunar Mystery," Science News, 150:314, 1996)



The shaded area marks a color phenomenon seen in the cráter Gassendi on April 30, 1966. (From our catalog: The Moon and the Planets)

ARISTARCHUS BLUSHES FOR CLEMENTINE

On p. 62, we digest an article from Sky 8> Telescope entitled "The TLP Myth." The strong implication of the ■ article is that TLPs (Transient Lunar Phenomena) are observer illusions or errors. Anomalists instinctively bristle at such dogmatic assertions. Especially so with TLPs, because literally hundreds of light flashes and color changes have been seen on the moon by reliable astronomers and amateurs ever since Galileo made his first telescope.

A satisfying rebuke to the TLP naysayers was recently delivered by JPL's B. Buratti at the October 1999 meeting of the American Astronomical Society in Padua, Italy. Her specific TLP occurred on April 23, 1994. At that time, about one hundred amateur astronomers noticed a 40-minute darken- ing near the edge of the bright lunar cráter Aristarchus. Happily, when this hundred-fold "illusion" took place, the lunar satellite Clementine was mapping the area around Aristarchus. Defying the dogmatists, Buratti scrutinized the Clementine data again. Sure enough, Aristarchus had really turned redder after the TLP reported by the amateur astronomers.

Such lunar color changes are readily explained as due to eruptions of poc- kets of gases trapped below the moon's surface. These blow-outB can spread colored dust over areas extensive enough to be visible through the small telescopes used by amateur astronomers.

(Seife, Charles; ”Moon Mystery Emerges from the X-Files," New Scientist, p. 22, October 23, 1999.)

Comment- In this context of overly rigid dogma, we repeat a truism voiced by physicist R. Feynman:

> Scientific knowledge is a body of statements of varying degrees of certainty---some most unsure, some nearly sure, none absolutely sure.
>
> Nevertheless, see the next ítem!

TLPs: ONE FADES, OTHERS FLASH

The TLP (Transient Lunar Phenomenon) reported above involved a 40-minute darkening of an area near the lunar cráter Aristarchus on April 23, 1994. The phenomenon was observed independently by some 100 amateur astronomers. The initial analysis of data returned at the same time by the lunar satellite Ciernen- tiñe at flrst seemed to confirm the ama- teurs' telescopio impressions. But after correcting the satellite data for lighting' geometry and other effects, Clementine's visión of the TLP faded away like the Cheshire Cat. TLP doubters were well- satisfied.

(Anonymous; "Lunar Surface Change: A False Alarm," Sky & Telescope, 99:22, March 2000. Cr. D. Barbiero)

Comment. Were the independent obser- vations by 100-or-so geographically disper sed amateurs all hallucinations?

The TLP "myth" does not fade away so easily. On the night of November 17/18, 1999, the Leonid meteors pelted the earth's atmosphere and, as one would expect, the moon's surface. The moon's atmosphere, however, is almost non- existent so its share of the Leonid sho- wer did not burn up before hitting the surface. But might not the high-veloeity impacts with the surface create luminous phenomena? To find out, a team of ob- servers monitored the dark side of the moon during the peak of the Leonid shower. Sure enough, at least six flashes were detected visually and on video tapes. They lasted only a fraction of a second and ranged in. brightness from 3rd. to 7th. magnitude.

(Anonymous; "Leonid Meteors Strike the Moon," Astronomy, 28:29, March 2000)

Comments. TLPs obviously do occur. But how was the energy of the impacting meteors converted into light flashes? A piezoelectric effect?

IT'S ALL IN THE SEEING

The August and September issues of Sky & Telescope contain articles that attempt to discredit long histories of observations of Transient Lunar Phenomena (TLPs) and the many, many anomalous coronas seen during total solar eclipses. Both classes of phenomena are written off as either observer misperceptions or idiosyncracies of the earth's atmosphere. Of course, such treatment of strange phenomena is not new, ñor is it undesirable, for we do want to confront reality whatever it might be. However, tbe two "wipes" in Sky & Telescope do seem a bit arrogant, especially when famous scientists do not hesitate to employ ghostly ephemera to support theories favored by the establishment.

We concéntrate here upon the arti- cle entitled "TLP myth."

There is a long history of (TLPs). Almost as soon as the telescope was invented, observers began seeing flashes of light, color changes, and other luminous phenomena on the moon. Reddish glows around the rims of the eraters Aristarchus and Alphonsus have long been aecepted as objective scientific observations. The most popular explanation of these color phenomena involves the eruption of gases around the eraters.

In 1964, in an attempt to better understand TLPs, NASA organized a network of amateur lunar observers with communication links to the Corra- litos Observatory in New México. Corralitos possessed a 5-inch reflector equipped with color filters which could checkout network sightings. In almost 3,000 hours of surveillance, no color phenomena were reeorded using the Corralitos instruments----even when the network reported a colored TLP in pro- gresa. Are all TLPs therefore illusory?

The NASA program certainly sug- gested that TLPs might be subjeetive phenomena, perhaps something like the colored coronas observed during solar eclipses. TLPs are still reported nevertheless. And there are also recognized phenomena that might account for TLPs. One such phenomenon is prismatic dispersión in the earth's atmosphere. On the moon's surface, thermolumine- seence is a possibility, as is the fluorescence of lunar soils being bom- barded by solar wind.

Even so, the gist of this S&T article can be seen in the following sentence:

> It is far easier to believe that mis- interpretations of mundane atmo- spheric and instrumental effects are responsible.

In other words TLPs, like anomalous coronas, can conveniently and legiti- mately be written off as observer illu- sions or errors!

(Sheehan, William, and Dobbins, Thomas; "The TLP Myth: A Brief for the Pro- secution," Sky & Telescope. 98:118, September 1999)

Comment. However, it is perfectly aeceptable to enlist analogous vague, marginal phenomena to support theories that are approved by mainstream Science, such as dark matter and dark energy. (See pp. 95+.)

LTPs AND ETs

Looking through our telescope for lighter fare, we dis cover a recent issue of Selenology. In it, A.V. Arkhipov, a member of the Research Institute on Anomalous Phenomena, based in Ukraine, presents a paper headed by the following abstract:

> The "invasions" of Earth's vehicles in certain lunar regions stimulate a statistically significant, real, tempor- ary increase in the probability of lunar transient phenomena there. It could be used as an indicator of a hidden alien presence on the moon also.

To Alústrate, says Arkhipov, the im- pact of Luna 2 and its rockét stage on the moon on September 13, 1959, was accompanied by light .flashes and cloud- like phenomena at at least four spots on the moon. Such LTPs (Lunar Transient Phenomena) seem also to be associated with the arrival of other terrestrial spacecraft in a few select regions of the moon, such as Mare Tranquilitatis and Gassendi. What generates these LTPs, and why only in certain areas of the lunar surface? Arkhipov's answer is in his above-quoted abstract.

(Arkhipov, Alexey V.; "'Invasiob Effect' on the Moon," Selenology, 13:9, no. 1, 1994) We have never examined this jour- nal.

Comment. Reigning paradigms make the moon a barren, lifeless place. But read- ers of SF should be aware that the popular literature puts forth assertions that the astronauts found more than rocks on the moon, and that NASA is covering up these discoveries. Some see artificial constructions in close-up photos of the lunar surface. There are even entire books devoted to an "alien presence" on the moon! Mainstream selenologists attribute the thousands of reeorded LTPs—all legitímate scientific phenomena---to gas releases, meteor impacts, etc., but certainly not ETs. Nevertheless, Arkhipov's correlation of LTPs and spacecraft activity should be checked out.

BEWARE THE IDES OF JUNE--------AND THE REST OF THE MONTH, TOO!

Three astronomical events, all within the short span of written human history, lead J. Hartung to warn us that June is a dangerous raonth for earthlings.

June 18, 1178. On the moon.

> ...just after sunset, it was reported by at least five men that the "upper horn of a new moon split and from the división point fire, hot coals, and sparks spewed out."

These observations have been inter- preted as eyewitness accounts of the impact on the moon that gouged out the cráter named Giordano Bruno, 20 kilo- meter s in diameter. •

June 30, 1908. Siberia.

> On the morning of June 30, 1908, a tremendous explosión deep in the Siberian taiga near the Tunguska river caused trees over an area of 40 km in diameter to be flattened in a radial pattern and produced a pres- sure wave in the atmosphere which circled the Earth.

June 17-27, 1975. On the moon.

> ...an unusual meteoroid "storm" was detected by the array of seismometers placed on the moon during the Apollo missions. The peak impact rate on the moon of 0.5—to-50-kg objeets was

about 10 times the normal background during this ínter val. Such a high rate was not reeorded at any other time during the 8-year operation of the Apollo passive seismic network.

Hartung links all three events to the comet Encke and the closely related Taurid Complex of naturally occuring space debris. Some chunks in this wide stream of space debris are measured in kilometers and, if they hit the earth, would far outclass the infamous Siberian projectile of 1908.

(Hartung, Jack B.; "Giordano Bruno, the 1975 Meteoroid Storm, Encke, and Other Taurid Complex Objects," Icarus, 104:280, 1993)

LUNAR M1SCELLANY

ANOMALOUS HORIZON GLOWS SEEN ON THE MOON

The spacecraft Clementine, now engaged in surveying the moon from orbit, has apparently reeorded once again a per- plexing sky glow that precedes lunar sunrises and follows lunar' sunsets. An astronaut standing on the moon watehing the spot where the sun is about to rise would see first of all two well- recognized phenomena: the solar corona (even though the solar disc is still well below the horizon) and the zodiacal light (sunlight reflected from inter- planetary dust). In addition, the astro- naut would detect a glow along the horizon itself, as in the illustration. Since the moon is virtually airless, there should be none of those gas molecules and suspended dust partióles that cause the sunsets and sunrises that we admire so much here on earth. Still, there must be something suspended above the moon's sur face to scatter light from the sun still located just below the horizon. The best guess is that lunar dust partióles are ionized by solar radiation and are repelled upwards from the surface and hang there suspended by electrosta- tic forces. But no one really knows for certain the cause of the glow.

(Cowen, R.¡ "On the Horizon: Clementine Probes Moon Glow," Science News, 145:197, 1994)

Illumination observed along the moon's western horizon about 15 minutes after sunset, as reeorded by a Surveyor spacecraft on the lunar surface. (NASA)

LUNAR CRATER CHAINS

The recent breakup of comet Shoernaker-Levi 9 into a long procession of frag- ments that subsequently crashed into Júpiter (p. 79) causes one to wonder whether similar events have occurred elsewhere in the BOlar system. On bodies with solid surfaces, the impaets of such processions would likely result in chaina of craters. Jupiter's moon, Callisto, in fact, displays a dozen or so cráter chaina that might be attributed to processions of projectiles.

How about our own moon? H.J. Melosh and E.A. Whitaker have studied the close-up lunar photos and found two good candidates. The more spectacular lunar cráter chain stretches 47 kilometers across the floor of the cráter Davy. (See figure.) This chain consista of about 23 pockmarks each measuring 1-3 kilometers on diameter. A similar, more degraded chain is found in the cráter Abulfeda. Meiosh and Whitaker suggest that:

> ...the Davy and perhaps the Abul- feda chains were created by tidally disrupted 'rubble pile' asteroids.

Photograph of the cráter chain on the floor of the lunar cráter Davy, (NASA)

(Melosh, H.J., and Whitaker, E.A.; "Lunar Cráter Chains," Nature, 369: 713, 1994.)

Comment. It is only natural to ask if the earth itself also bears the scars in- flicted by similar processions of celestial debris. In vol. 1, p, 185, we described one such possibility located in Argentina. There are also those several hundred thousand Carolina Bays concentrated along the southeastern U.S. seacoast. These shallow depressions are in a shot- gun pattern but are also thought to be the consequence of impaets—perhaps a cloud of debris rather than a procession. (See vol. 1, p. 185.)

THE MOON: STILL PARTLY MOLTEN?

Our long-time impression has been that our moon is a coid body, solidified eons ago, when its primordial ration of heat radiated away. But the lunar sateUite Clementine—tracked with great precisión by lasers on earth—undulates suspiciously as it orbits the moon.

> The overall shape of the orbit traces the broad tidal bulges raised on the moon by Earth and the sun; the size and timing of the bulges depend on the moon's rigidity. The Clementine data show that somewhere, probably deep in its interior, the moon is not quite as rigid as solid rock would be. Most likely, part of the rock is still molten.

(Kerr, Richard A.; "Clementine Mines Its First Nuggets on the Moon," Science, 264:1666, 1994)

MARS

In contrast to cloud-shrouded Venus, Mars can be studied readily through terrestrial telescopes. Even better, this planet has been visited repeatedly by spacecraft: fly- bys, orbiters, and landers. We should know a lot about Mars, and we do, but more mysteries arise with every spacecraft visit.

Although we have dispelied P. Lowell's notion of Martian canals, we still cannot decide whether the planet was once eroded by rivers. and graced by lakes and a shallow sea or was always dry and dusty. The great Martian dichotomy——its topographical split into highlands and cratered lowlands—speaks of some unplumbed ancient catastrophe. As for life on Mars, all hints of it that have been followed up have been negative. But we still have hope.

We have divided our decadal collection of Martian digests into the five categories indicated below. The fifth category—miscellany—should not be skipped over. Often small oddities become profound once we learn more about them.

•The Geology and Geophysics of Mars. The topographic dichotomy, the seeming lack of water, magnetic stripes.

•The Question of Life on Mars. Hints in Martian meteorites, forest- like apparitions.

•Fiares and Bright Spots.

•That Supposed "Face[11] and Its Elucidation. A continuing story with two sharply divided camps.

•Martian Miscellany. Curious shadows, cirrüs clouds, whirlwinds, the "stealth" región.

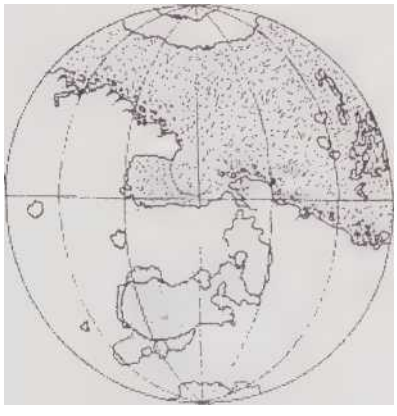
THE GEOLOGY AND GEOPHYSICS OF MARS

THE FLAT FACE OF MARS

Mars has two puzzling "faces": (1) That' human-like visage at Cydonia; and (2) The whole northern hemisphere or "face." The latter is definitely real and con- sists of an immense, low-lylng plain centered roughly on the planet's North Pole. The opposite face of Mars is occu- pied by rough, crátered highlands.
This sharp, profound crustal dichotomy has been known for many years and has resisted explanation.

On p. 67, T. Van Flandern advanced the theory that the rugged Southern highlands are composed of the debris from an exploded planet which Mars once attended as a satellite. Be that as it may, there is something puzzling about the northern plains.

We now have information from the Mars Global Surveyor (MGS), now orbit- ting the red planet, that the low-lying northern plains are much flatter than thought. For thousands of kilometers, they are smooth on a scale of hundreds of meters. This is flatter than the lava flows of the lunar maria; flatter than the smoothest central Sahara. These startling data come from the MGS's láser altimeter that can measure eleva- tion of the terrain below it with 10-meter accuracy averaged over the beam width of 150 meters.



Eastern hemisphere of "two-faced" Mars. (Bottom) The cratered highlands. (Top) Lowland plains.

The only known terrain in the entire solar system that can match this flat- ness is the abyssal, sediment-filled floor of the South Atlantic. Hmmm!
Does this imply that the northern plains of Mars were once an ocean floor? That's the favorite interpretation today. Of course, they might also be lava plains created by a colossal ancient impact, made smoother by blown dust.

(Kerr, Richard A.; "Surveyor Shows the Fiat Face of Mars," Science, 279:1634, 1998.)

MARS: THE LAND OF BROKEN PARADIGMS

That's what astronomer B.C. Murray called Mars in an interview on the Planetary Soeiety's web site. It seems that the Mars Global Surveyor did considerable damage to some highly regarded models of the red planet. Here is some of the wreckage mentioned by Murray.

•The moon has a thick debris layer—about 3 meters thick on a lunar mare. "Astonishingly, Mars lacks a debris layer." Why?

•"Along with the lack of regolith, Mars is deficient in small craters. It is as though something has been operating to either protect the surface or scrape it olean, but we don't know what that something is."

• ..."all of a sudden we discover there are huge [magnetic] anomalies on Mars' surface.. .First of all, because the anomalies are so large—ten to a hun- dred times the size of crustal rock anomalies on the Earth. And on Mars we have no clue what causes them. Second, the anomalies are mainly in the Southern hemisphere, not in the north. That's a clue to something if only we are smart enough to figure it out. And then there's Helias----a huge basin, almost 2,000 kilometers [1,250 miles] across, with no anomalies."

•"So the same instrument, TES [Ther-mal Emission Spectrometer], detected hematite, which needs moisture to form, and also feldspar, which wouldn't exist if moisture were present. While there are those who still argüe for a warm, wet period on Mars, to me, it's another mys- tery, another broken paradigm."

The interview ran seven pages and was littered with shattered paradigms.

(Murray, Bruce; "Mars, Oíd and New: A Personal View by Dr. Bruce Murray," Planetary Society web site, September 18, 2001. http://www.planetary org/ html/ society / advisors /murray / tpr artide. html. Cr. S. Jones)

THE EARTH MADE MARS DIFFERENT

At the June, 2000, meeting of the Society for Scientific Exploration, R.A. Day presented a paper that:

(1) Itemized the many important ways in which Mars differs from the other inner planets and moons;

(2) Proposed a mechanism that might have created these stark differences; and

(3) Identified the earth as the most likely perpetrator of this celestial catastrophism.

Day's abstract foliows:

> **Mars has surface features that are not seen on inner planets or moons. These are hemispheric asymmetries, idiosyncratic surface fracturing, localized vulcanism, altitude differences, chains of pits, and the nature of dry river-like channels. Other features inelude extensive loss of an early atmosphere and liquid water. There is interest in the lower-altitude northern región, with its surface formed after the period of heavy bombardment, as a possible ocean basin. The evidence for this is very sparse: no river deltas, no river net- works, little debris at the ends of the catastrophic flow channels. The sur- face is consistent with the stripping anticipated by a Roche-limit encounter. The low-density Martian moons appear to be unconsolidated material of higher density; they appear to be from low-gravity aggregation of that part of the Martian debris that went into orbit as a short-lived ring. A Roche-limit encounter is invoked as a reasonable hypothesis to explain these features. Earth, Mars' nearest planetary neighbor, may have provided that encounter. The Roche limit is 2.9 Earth radii.**

The Roche limit is that distance within which Mars would begin to be torn apart by the gravitational pulí of nearby Earth.

(Day, Richard A.; "A Roche-Limit Encounter Explains Martian Features," Society for Scientific Exploration paper, 2000)

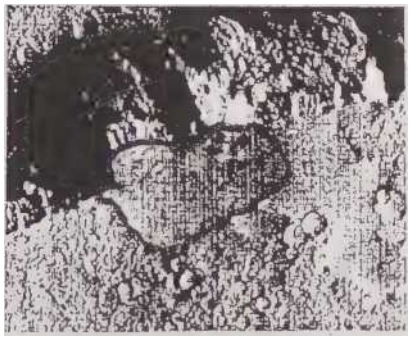
Comment. Anomalists with long memories will see immediately that Day's theory is displaced Velikovskyism. Velikovsky had Venus straying cióse to Earth in recent times to account for historical and geological evidence of terrestrial catastrophism.

Another related theory claims that the earth's moon was created when Mars dealt earth a glancing blow------a reversal of Day's scenario. Obviously, both cannot be coi'rect.

ICE-COVERED LAKE ON MARS?

The MarB Global Surveyor snapped an intriguing photo while orbiting over latitude 24.65°, longitude 207.10°. It looks like a lake! There even seem to be reflections of the surrounding terrain. But, as T. Van Flandern comments, this glassy-looking area cannot be liquid water because the vapor pressure is too low on Mars water would quickly eva pórate away. Ice, however, is a strong possibility.

(Van Flandern, Tom; "'Lake' on Mars?" Meta Research Bulletin, 8:30, 1999. For details, go to: http://www.cbjd.net/ orbit *I* mar s / steadlake. html)



A rather fuzzy photo of what is hypo- thesized to be an ice-covered lake on Mars (outlined). Hará to see, but some surrounding hills may be reflected.

Comments. The reference did not specify the Martian hemisphere, but it was probably the northern, where there are extensive lowlands. In fact, if water once did flow on Mars, 75% of it would have drained into these lowlands.

(Anonymous; "Mars in 3-D," Science News, 156:11, 1999.)

Baek in 1976, the Viking Orbiter sent back pictures of so-called "Bearch- light areas" in the northern hemisphere. The speculation then was that these glassy, seemingly transparent features might be thin layers of ice. (See our The Moon and the Planets)

A MARTIAN PUZZLE

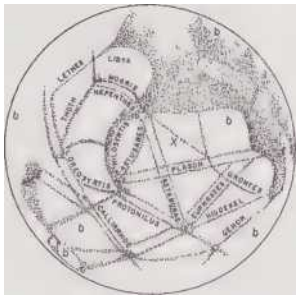
The Science article referenced below posed four questions about the solar- system's planets. One concerned Mars; the other three are presented under their respective planets.

Question

How could Mars—now more than 50°C below freezing—have been warm enough in its early days to have water flowing on its surface?

Answer suggested. Possibly because of geothermal heat.

(Kerr, Richard A.; "The Solar System's New Diversity," Science, 265:1360, 1994)



A drawing of some Martian lineaments ("candis") made by the astronomer G.V. Schiaparelli in 1888. A few years later, P. Lowell claimed he discerned a vast network of artificial canals.

WHITE MARS?

Earth is called the "blue planet" by virtue of its thin veneer of blue ocean water. Mars is now red because of its endless vistas of reddish soil and rocks, But most planetary scientists now insist that Mars was once blue, too. It was drained by gushing rivers and supported a vast ocean. The planet's many chan- nels and layered deposits seem to prove Mars was, like Earth, once a water-rich planet. We like to think this way be-cause we so much want to find life on our sister planet, and to us water is life!

Not so fast! says N. Hoffman from La Trobe University in Victoria, Australia.

According to his hypothesis, water has had little or no importance in shaping the Martian landscape. In- stead, his 'White Mars' model con- tends that the gurgling, frothing and sometimes explosive venting of carbón dioxide gas from beneath the surface created the features.

Outrageous as Hoffman's hypothesis is, it is supported by several significant observations that seem to deny a watery Mars.

•The Mars Global Surveyor has not detected any carbonate minerals that should have been created when water interacted chemically with the planet's CC≥2 atmosphere.

•Surface photos fail to show the fine networks of tributarles that should have fed the larger drainage features if water were the agent of erosión.

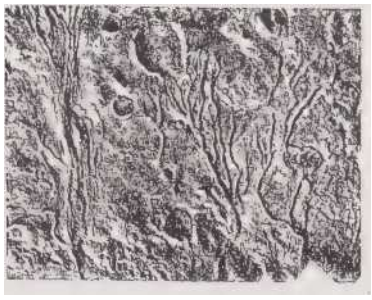
•There is no evidence of lar ge lakes or reservoirs at the heads of the so- called "flood channels."

•Except for a small amount of water ice at the polea, Mars is dominated by solid and gaseous $C0_2$.

One would not expect that carbón dioxide could mimic erosión features like those carved out by terrestrial water. However, Hoffman points to the deva-stating erosión caused by terrestrial volcanic explosione with their blasts of gases and ash; their mudflows, and their avalanches that gouge the terrain for many miles.

(O'Hanlon, Larry; "The Outrageous Hypothesis," Nature, 413:664, 2001.)

Comment. See p. 248 for a spectacular "dry" erosion event on earth.



Photograph of Martian channels just west of Chryse Planitia taken by Viking Orbiter L (NASA)

MAGNETIC STR1PES ON MARS

As the Mars Global Surveyor swooped down to altitudes between 100 and 200 kilometers above the Martian surface during its aerobraking orbits, magneto- meters detected broad, parallel stripes with alternating magnetic polarity. These stripes across the planet's Southern high- lands are a great surprise to planetolo- gists because they superficially resemble the magnetic stripes that parallel the rifts along the floors of the earth's oceans where new erust is forming. The obvious implication is that Mars once possessed drifting continente and a geo- magnetic dynamo that occasionally re- versed its polarity—just as has suppos-edly happened and is still happening on earth. Prior to this discovery, Mars was deemed too small to have possessed a heat-driven geodynamo, and there is no obvious surface evidence of drifting continente .

Easy as it is to concludé that Martian continente once sailed ponderously cross the planet's surface, the scientific jury is still out. First of all, the Martian magnetic stripes are substantially differ- ent from earth's in shape, pattern, strength, and, above all, size. The Martian stripes are about 200 kilometers wide and 2,000 long—much larger than earth's. Their magnetic field strength is more than tén times that of the terrestrial stripes. Whatever magnetic phenomena occurred on Mars some 4 billion years ago musí have been quite different from what happened on earth 200 million years ago. Yet, no other reasonable explanation has been found for the Martian magnetic stripes.

(Acuna, M.H., et al; "Global Distribution of Crustal Magnetization Discovered by the Mars Global Surveyor MAG/ER Ex- periment," Science, 284:790, 1999. Cowen, Ron; "Píate Tectónica.. .on Mars," Science News, 155:284, 1999. Recer, Paul; "Mars May Have Been Earth-Like," Northwest Florida Daily News, April 30, 1999. Cr. R. Reid.)

Comment. Actually, the earth's geodynamo is not perfectly understood, especially its tendency to quickly reverse polarity. We may not know what is really happening inside the earth either.

THE QUESTION OF LIFE ON MARS

THE FORESTS OF MARS

The Web is a source for all manner of speculation, such as the following:

> **Recently, some new images have come to light, courtesy of Graham Orme, taken by MGS [Mars Global Surveyor] ín 2000 near the Martian south pole, of more unusual landforms which for all the World look like large-scale vegetation of some sort or possibly ancient coral, as has also been sug- gested. Is this really evidence of macro life, past or present, of just another form of unusual geology, which Mars is becoming known for?**

(Anderson, Paul; "The 'Forests of Mars': Biology or Exotic?" http://geocities.com/erasprojeet/marsforest.html, April 4, 2001. Cr. D. Phelps.)

Comment. Claims of Martian vegetation go back almost a century. The so-called "wave of darkness" that moves toward each Martian polar región with the ad- vent of spring was claimed to be due to greening vegetation. See The Moon and the Planets.

The Martian "ghost forests" are probably just frost ferns or mineral rjj'owths of some kind.

GHOSTLY MARTIAN "FORESTS"

NA.SA's MarB Global Explorer has sent back images of peculiar formations that resemble earthly trees and bushes. Sprouting in the vicinity of the Martian south pole, these "growths" are easily hundreds of yards wide. Since tempera- tures fall below -200°F in these Martian "forests" this is certainly not "life as we know it"—it is probably not life at all!

Current thinking is that these Martian formations are indeed growths, though lifeless ones, much like those mineral spires that sprout around the edges of mineral-rich lakes. The tufa mounds and towers at Mono Lake, Califoi'nia, are good examples, but on a much smaller scale. On Mars, the growths are probably frozen carbón dioxide.

(Gravitz, Lauren; "Ghost Forests of Mars," Discover, 22:18, November 2001.)

Reference. See "Curious Columnar Struc- tures" in our catalog Carolina Bays, Mima Mounds, etc.

PLANT LIFE ON MARS?

> **Strong evidence that plant life exists on Mars was advanced today by Earl C. Slipher, American astronomer, after observation of the planet, which is closer to the earth this month than at any time since 1924.**
>
> **His theory is founded on an ap- parent change in the planet's surface, regarded as his most important dis- covery.**
>
> **The huge dark spot (Solis Lacus) or the Great Eye of Mars, seems to have assumed a shape not observed for flfty years, if ever before. Mr. Slipher indicated that this was strong evidence that plant life existed on the planet, and suggested that the change was due to fresh vegetation over an area roughly the size of the United States.**

(Anonymous; "Evidence of Plant Life on the Planet Mars Is Announced by an American Astronomer," New York Times, July 21, 1939. Cr. M. Piechota.)

Comment. What a difference 59 years make! Could those tiny structures in ALH 84001 be fossilized pollen grains? See p. 154.

MICROSCOPIO LIFE ON MARS?

The worm-like structures present in that (supposed) Martian meteorite ALH 84001 superficially resemble miniature bacteria. On this basis, NASA loudly proclaimed that they might be the fossils of primi- tive Martian life forms. (p. 154)

Some scientists were suspicious of this claim. J.P. Bradley et al, in a recent letter to Nature, declared the puta- tive fossils to be only the fractured sur- faces of lifeless crystals. Responding, K. Thomas-Keprta insisted that her group was not so stupid that it would mistake crystals for fossils! Her group, too, had noticed the crystals. The claimed fossils are much larger and more numerous than the crystals. To settle the matter, Thomas-Keprta and associ- ates plan to dissect the suspect structures .

(Bradley, J.P., et al; "No Nanofossils in Martian Meteorite," Nature, 390:454, 1997. Also: Kerr, Richard A.; "Putative Martian Microbes Called Microscopy Arti- facts," Science, 278:1706, 1997)

FLARES AND BR1GHT SPOTS

"THE MOST EXTRAORDINARY TEMPORARY PHENOMENON EVER SEEN ON MARS"

Our title is a direct quotation from the article referenced below.

July 9, 1922. Lowell Observatory, Flag- staff, Arizona. Dr. V.M. Slipher and other ástronomers observed a large, brilliant, white spot just south of the Margaritifer Sinus región. Slightly less bright and a bit more yellowish than the Southern polar cap, the spot was 800 miles long by 400 miles wide. On the night of July 10, the spot had dissolved into a much larger area, losing much of its brilliance. By July 14, it had disappeared.

(Slipher, E.C.; "The Great White Spot in the Martian Tropics, July 9, 1922," Astronómica! Soeiety of the Pacific, Pub- lications, 34:215, 1922)

Comment. Almost certainly, this was a short-lived dust storm. But what caused it?

A bright fiare seen on Mars through the telescope on June 4, 1937.

MARTIAN "FLARES"

Focussing now on Mars, a long-lasting mystery has been the source of the rare "fiares" or bright flashes of light that have appeared on the Martian surface down the years. A famous fiare example was observed and reported in 1900 by A.E. Douglass, at the Lowell Observa- ory. The popular press- quickly announced that the Martians were signal- ling us. Actually, this assumption was quite understandable because in those days the newly discovered Martian "canais"! were in everyone's thoughts. Most scientists, however, rejected the signal notion preferring to attibute the fiare to the specular reflection of sun- light from snowy peaks on Mars.

But they were wrong, too. Close-up inspection by modern spacecraft has re- vealed no snowy peaks or large bodies of water on Mars that might mirror the sun. But another possibility has now come to the fore. The Martian fiares could be reflections of sunlight from fíat, hexagonal crystals of water ice in' the thin Martian clouds; the same crystals that create some of the solar halos

and sun dogs seen on earth.

That this sort of specular reflection does occur was demonstrated on June 7, 2001, when a fiare was actually photo- graphed .in the area of Edom Promontor- ium. The photography was possible be- cause scientists had been watehing this spot intently—with cameras at the ready

because a well-ob served fiare had oceurred at this location in 1954, and calculations showed that conditions would be just right for the sun to be again reflected by clouds at this spot on June 7, 2001. It was a prediction that carne true.

Sunlight reñected from Martian clouds cannot be the total answer, though.
An area called Tithonius Lacus, for expropie, is the source of many fiares, but it is too coid in this part of Mars for clouds of water-ice crystals to exist.
No closed book here!

(Dobbins, Thomas, and Sheehan, William; "The Martian-Flares Mystery," Sky & Telescope, 101:115, May 2001. Anony- mous; "Source of Flashes of Light Found," Fort Worth Star-Telegram, June 24, 2001. Cr. D. Phelps.)

Comment. The Martian-flare phenomenon is reminiscent of the "Perseus-flasher" discussions in 1987. (vol 1, p. 86) The frequently ob served flashes of light seen in the constellation Perseus turned out to be sun glinting off an artificial satellite.

THAT SUPPOSED "FACE" AND 1TS ELUCIDATION

AN EXPLODED PLANET AND THE "FACE ON MARS"

Between Mars and Júpiter swirls the main main asteroid belt. In the view of many astronomers, including T. Van Flandern, there resides the debris of an exploded planet. Van Flandern has adduced considerable evidence supporting the exploded planet hypothesis, which we will pass over in favor of a look at the possible effects of said exploding planet upon a large but equally hypothetical satellite of said planet. Such a satellite would have been heavily pelted by debris on the side faeing the exploding planet. Furthermore, this battered sphere, having lost its gravitational "anchor," would assume a new orbit around the sun as well as a new orienta- tion in space.

Is there any object in the solar System plastered mainly on one side with debris and craters? You guessed it:
Mars!

What possible connection could there be between this purported cataclysm and the "face on Mars"? The connecting thread is very weak but so beguiling that we must mention it.

T. Van Flandern has proposed eight tests for the artificiality of the "face" and its associated "pyramids," "city," etc. One is the three-dimensionality of the "face." Another is the "fractal" test, which is useful in distinguishing between artificiality and naturalness. The "face" readily passes four of the eight tests. A fifth test (bilateral symmetry) cannot be decided until we get more pictures. But failure looms on the last three tests (location, orientation, cultural purpose), unless Mars is sent back to the time when it was a satellite of the as-yet-unexploded planet. Then—a couple billion years ago ----the "face" would have been smack on the equator of Mars-to-be, gazing down- ward perpetually upon the doomed planet. The "face" thus had a cultural purpose, a sort of eosmic "Big Brother." Carrying these thoughts to their logical conclusión, the inhabitants of the planet had colon- ized their "moon" and built those contro- versial "structures."

(Van Flandern, Tom; "New Evidence of Artificiality at Cydonia on Mars," Meta Research Bulletin, 6:1, 1997)

Comment. We cannot resist adding two more thoughts to all this speculation: If life on Mars really did (does) exist, it probably really originated on the sup- posed exploded planet! Could the explosión of this planet have seeded the earth with life, say, at the time of the unexplained Archean Explosión?

IT DEPENDS ON HOW YOü LOOK AT IT!

The "Face on Mars," that is; that eroded hill in the Cydonia región that vaguely resembles a human face. When a recent photo of the "Face" taken by the Mars Global Surveyor (MGS) was published far and wide in the Science press, we • thought the matter had finally been set- tled. The photo showed an strange hill obviously seulpted by natural forces. No question about it; there was not a so.up- con of artificiality.

But it now seems that if you look at the "Face" at other lighting angles and process the same data in different ways, the "Face" reappears looking more artificial than ever.

T. Van Flandern elaborates:

> The MGS spacecraft took a high reso- lution photo of the "Face on Mars" in April 1998. That image suffered from four handicaps: a low viewing angle; a low Sun angle from the direction under the "chin"; an almost complete lack of contrast; and enough cloudi- ness to scatter most of the light and eliminate shadows. To add to these difficult circumstances, JPL-MIPL [Jet Propulsión Laboratory-Mission Image Processing Laboratory] personnel, apparently judging that the contro- versy over artificiality would not be ended when the actual photo was re- leased, processed the image through two filters having the effect of flat- tening and suppressing image details. This step is documented at a JPL web site. Here we do image processing correctly and present the results of Computer corrections to compénsate for the poor lighting and low viewing angle. The actual image shows olearly the impropriety of the JPL-MIPL actions because the visual impression of artificiality persists. However, appearances after a discovery are not a valid basis for drawing conclusions, but only for forming hypotheses for further testing. This is called the a priori principie of scientifie method. The 1976 Viking imagery allowed the formation of competing hypotheses, natural vs. artificial origin, and tests to distinguish them. When applied to the high-resolution MGS image of the Face, all artificiality predictions were fulfilled despite a lack of background noise. The combined a priori odds against the natural origin of the Face on Mars are 10** to 1.

(Van Flandern, Tom; "Proof That the Cydonia Face of Mars Is Artificial,"
Meta Research Bulletin, 9:22, June 15, 2000.)

Comment. Will conspiracy buffs suspect that something is awry in all this? You bet they will!

MARTIAN MISCELLANY

A POT PODRRI OF MARTIAN CUSIOS- ITIES (AND WE DON'T MEAN "FACES" AND "PYRAMIDS")

A shadow and grid-like pattern.

> ...the recent Phobos probe that the Russians sent to Mars in 1988----- which met a mysterious and untimely demise—recorded two quite mysterious anomalies on the planet beforé contact was lost with the satellite.
> One was a strange shadow moving across the. planet's surface (not a shadow of either of Mars' moons)!
> The other anomaly was a strange grid- like pattern at one location on the Martian surface; it was photo- graphed with an infrared camera on Phobos 2, the first such instrument carried on a spacecraft sent to Mars. (Ref. 1)

The canals are still there—in a shadowy way! Commenting upon the theory that those Martian canals that keep showing up on plates made through terrestrial telescopes are only pieture/film defeets, D. Louderback points out that the:

> ... canals are also showing up on CCD [Charge-Coupled Device] camera photos like the one taken by Donald Parker with a 12.5-inch reflector and shown on the cover of the Strolling Astronomer earlier this year. It clearly showed a pentagonal pattern of canals surrounding Elysium. It is almost certain that these were not a "picture defect"! (Ref. 1)

Searching for explanations, J. Gallagher has discovered that many of the promi- nent canals drawn by Lowell, Schiapa- relli, et al, actually closely follow con- tour lines drawn on USGS maps of Mars from Viking data. It is quite possible, then, that the "canals" are really only elevational differences in Martian topo- graphy. (Ref. 2)

Global Cooling. The Hubble Space Telescope recently photographed Mars when the planet was nearly totally shrouded by high cirrus cloudB. Mars is now cloudier than it has been for years.
The reason for this is that the planet's average temperature has fallen by almost 20°C. What little water vapor exista in the atmosphere freezes out into cirrus clouds.
Why has Mars cooled so drastically?
Because the huge dust

storms of the Viking years have ruysteriously abated. Now, we have to explain why dust storms no longer envelope the planet! (Ref. 3)

(Ref. 1. Louderback, Daniel; Letter, Strolling Astronomer, 37:131, 1994.
Ref. 2. Gordon, Rodger; Letter, Strol- ling Astronomer, 37:89, 1993. Ref. 3. Kerr, Richard A.; "Hubble Glimpses a Hazy Day on Mars," Science, 267:1912, 1995)

FROM AMD SIN G LITTLE VORTICES TO GIANT RED DEVILS

In the sunny hayfields of North America, it is not uncommon to see telephone wires festooned with strands of newly mown hay. This fodder was raised and deposited there by playful whirlwinds. Though frustrating to the farmers, these summer events are only an amusing feature of rural life.

In the western states, where hayfields are often supplanted by sun- scorched dusty plains, the same atmo- spheric convection forces raise snake- like dust-devils that may reach 100 meters in height as they progress erratically across the arid land. If you have a radio receiver, you can often hear them coming, for electrostatic fields of several tens of volts per meter are ereated in these vórtices. These fields can produce crack- ling sounds at radio frequencies.

On Mars, whirlwinds cease to be amusing. The atmospheric density there is only l/100th that on earth, so one wonders how whirlwinds can arise at all. But arise they do, sometimes to heights of 10 kilometers with bases a kilometer across. Sometimes a half dozen will grind their ways across the plains together. Spacecraft have photographed dust-devil tracks many kilometers long scratched into the Martian landscape.

What generates these towering monsters in a near-vacuum? Actually, the same sun-driven convection forces that were so carefree with the farmer's hay. But these forces are much stronger on Mars. The Pathfinder spacecraft re- eorded a temperature of 16°C near the sun-heated surface but only -7°C a meter higher. This temperature differential is enough to create powerful swirling convection cúrrente that seem to feed upon themselves and grow into monsters that could be serious threats to astronauts.

The Martian dust swirls could abrade exposed instruments and scour the visors of anyone caught in the open.

If an exposed astronaut could see to find his way to shelter, he could be in for a shock----a 1,000-volt electrostatic shock—because it is almost a certainty that the Martian dust devils are potent electrostatic generators. If the highly charged astronaut contacts a spaceship with flammable fuel, anything could happen.

(Daviss, Bennett; "Red Devils," New Scientist, p. 34, June 8, 2002.)

THE "STEALTH" REGION OF MARS

Now that the Mars Global Surveyor has convinced almost everyone that the famous "face" on this planet is really only an eroded mesa, we can attend to some other Martian curiosities. One of these is the so-called "stealth" región.

For some 2,000 kilometers along the Martian equator west of Arsia Mons and Pavonis Mons stretches an area that is invisible to terrestrial radar. Of course, we can see this región; but, when a 3- eentimeter radar is pointed at it, no detectable echoes are returned. Thus, the term "stealth," as in the F-117 Stealth aircraft,

Are the clever Martians trying to conceal something from prying earthlings, using, say, a "cloaking" device a la Star Trek? Of course not. Loose, un- consolidated sediments are poor re- flectors of radar waves. Examination of Viking-Orbiter photos tell geologists that the "stealth" región is almost cer- tainly thickly strewn with volcanic ash, which would absorb the radar waves ver y well.

(Edgett, Kennth S., et al; "Geologic Context of the Mars Radar "Stealth" Región in Southwestern Tharsis," Jour- nal of Geophysical Research, 102:21,545, 1997.)

THE EXTREMOPHILIC TERRAFORMING OF MARS

If we are to colonize Mars. we must make it more earthlike; and that is what terraforming does. Right now, the Martian atmosphere, surface temperatures, level cf ionizing radiation, and noxious soil are inimical to delícate, complex life forms, such as us. But these hostile Martian conditions are easily endured by some bacteria, such as Deinococcus radio- durans. This bacterium, one of the ex- tremophiles, lives in our sewage systems and other unpleasant places. It can sur- vive desiccation, freeze-drying, and high radiation levels.

D. radiodurans can do more than sur- vive on Mars. It can begin to detoxify the soil and prepare the way for other pioneer microorganisms. And even more.

> What D. radiodurans can provide is a microscopio (and therefore easily portable) factory-----a kind of terra forming toolkit—from which any num- ber of products potentially can be derived. Whether it is engineered to reduce metáis, produce drugs for ailing astronauts or simply manufacture the polymers necessary for the production of thread, D. radiodurans, one of the world's oldest bacteria, may provide a means of expanding the limits of human imagination beyond the written sci-fi page.

(Slotnick, Rebecca Sloan; "Extremophilic Terraforming," American Scientist, 88: 124, 2000)

Comment. Perhaps D, radiodurans is the oldest bacterium en earth. Having arrived eons ago on a bit of cosmic debris. It quickly set up shop on what was then a planet hostile to complex life. Perhaps earth itself has been terraformed!

Nature's plan is all so obvious, extremophiles first terraform planets and then Gaia sustains the conditions appropriate for complex life. But where did it all begin?

JUPITER

~~The most massive planet of our solar system is Júpiter. The naked eye sees Júpiter as a bright jewel in the night sky; and some sharp-eyed observers claim that they can even see Jupiter's four largé "Galilean" satellites without a telescope. With a little optical help, however, these four moons (lo, Europa, Ganymede, and Callisto) seem to be bright~~
~~planets circling a miniature sun————a solar system within the solar system. It is, in fact, these sanie Galilean satellites that generate almost all of the Jovian anomalías garnered by Science Frontiers during the períod~~ 1994—2004.

PAIRS OF GHOSTLY SPOTS SWEEP ACROSS JUPITER

Atop Hawaii's Mauna Kea, NASA'ʙ Infra- red Telescope Facility has detected a pair of infrared-bright spots that race across Jupiter's upper atmosphere in tune with the motion of lo, one of Jupiter's large, Galilean satellites. This synchronism suggests some sort of energy interchange between lo and the top of Jupiter's atmosphere. The theory now in vogue states that Jupiter's rota- ting magnetic field induces a voltage across 2300-mile-diameter lo, resulting in an electrical current of some 5 million amperes flowing between lo and Júpiter, some 262,000 miles away. In this bizarre electrical Circuit, the two moving "terminais" on Júpiter, in the northern and Southern hemispheres, are heated by the current flow and show up as fuzzy infrared-bright spots.

(Cowen, R.; "Júpiter and lo: Infrared Spots Mark Link," Science News. 144: 325, 1993)

Comment. In passing, it should be remarked that lo is mantled by a cloud of electrically conducting sodium vapor. A weml moon in other respecta, too, lo occasionally casts double Bhadows on Jupiter's upper atmosphere during transita. See our catalog The Moon and the Planets. You will find there, in

addition, tliat ínfraréd-hot shadows of the satellites Ganymede and Europa are mentioned. Very strange!

JO VIAN LIGHTNING OH COSMIC SHORT CIRCUIT?

In July, 1994, the comet Shoemaker- Levy 9 is scheduled to meet a fiery end as it plunges into Jupiter's atmosphere. Since this cataclysm is predicted to oc- cur on Jupiter's far side, the pyro- technies will be largely hidden from our telescopes. Yet, if any of Jupiter's four large Galilean satellites are swinging behind Júpiter during the comet's im- pact, but still visible to us by virtue of their distances from Júpiter, we might see one or more of these moons suddenly brighten due to light reflected from the incineration below.

This very well might happen, and something similar has happened before. On July 26, 1983, just 6 minutes after it emerged from behind Júpiter, the Galilean satellite, lo, suddenly brighten- ed by 50%----a "flash" that lasted 118 seconds. Now, lo is notoriously fickle brightness-wise. Its post-eclipse bright- ening has long puzzled astronomers, but this short, intense flash was even more anomalous than usual. H.B. Hammel and R.M. Nelson suggest that this 1983 flash might have been the reflection of some catastrophic event occurring on the hidden half of Júpiter--------possibly the impact of some large object------or, even more intriguine, Jovian lip-httvmcr.

(Hammel, H.B., and Nelson, R.M.; "Bright Flash on Júpiter in 1983," Nature, 366:117, 1993)

Comment. Could this Jovian "lightning" actually nave been an electrical spark? This thought dovetails nicely with the pair of "ghostly" infrared spots that race across Jupiter's surface in syn- chronism with lo's orbital motion. The two spots are believed to be the moving terminái s of a gigantic electrical circuit that stretches from Jupiter's surface to lo and back again. The 1983 flash might have been a current surge in this cosmic circuit.

Typical briffhtening curve of the Jovian satellite lo after emerging from the planet's shadow. Additional details in vol. 1, p. 67.

HAS JUPITER FLASHED BEFORE?

Well, not Júpiter itself but its strange Galilean satellite lo. On July 26, 1983, lo suddenly brightened by about 50% for just under 2 minutes. The "flash" represented an emission of energy of some 10° ergs, which is equivalent to the impact on the satellite of an ice mass 5-kilometers in diameter moving at 60 km/sec. This collision interpretation is encouraged by the 1994 impacts of cometary fragmenta on Júpiter proper.
In the case of lo, however, there is another possibility: electrical arcing.
lo's volcanoes are prodigious spewers of metallic sodium, and T. Gold has specu- lated that colossal ares may occur in this eonducting environment as lo cuts through Jupiter's magnetic field.

(O'Brien, Roger; "Has Júpiter Flashed Before?" British Astronomical Association, Journal, 104:6, 1994.)

WHAT'S COOKING ON EUROPA?

Data streaming back to earth from the Galileo spacecraft encode a curious fací about Europa, one of Jupiter's large, Galilean satellites. The nighttime flow of heat from Europa's polar regions is 1 watt/meter^ higher than can be ac- counted for by all known mechanisms, such as the tidal heating created as Jupiter's powerful gravitational field flexes the satellite's integument.

(Anonymous; "Cozy Nights," New Scien- tist, p. 27, June 5, 1999.)

Comment. What is happening beneath Europa's iey surface? "Something won- derful"? Recall that in the film 2010, humans were "given" all worlds except Europa. Was A.C. Clarke prescient again?

EUROPA'S ANOMALOUS INFRARED SPECTRUM

Most astronomers agree that Europa, one of Jupiter's large Galilean satellites, is encased in ice. But its infrared spectrum is not exactly that expected from puré water ice. An unidentified substance is distorting the spectrum. Terrestrial ex- perimenters have frozen different mixes of salte trying to simúlate Europa's infrared spectrum but to no avail.

On a hunch, astrogeophysicist B. Dalton examined the infrared spectra of some of earth's extremophile bacteria (i.e.i those able to survive extreme environmental conditions). The bacteria were subjected to Europa's forbidding conditions of -170°C and a near-vacuum. (Europa has no atmosphere to speak of.) Not only did the bacteria survive but their infrared spectrum was cióse to that acquired from Europa observations. To the naked human eye, these particular terrestrial bacteria are pink and brown, which could account for the reddish patches seen on Europa's icy surface.

(Jones, Nicola; "In the Pink," New Sci- entist, p. 9, December 8, 2001)

Comments. In the movie 2010, the god- like monolith gave humans dominión over. all the worlds save Europa. In the movie, the "fertile" spot on Europa happened to be green; but at lear.t A.C, Clarke had picked the right satellite! The movie did not ask how the monolith was created ----a question that to us seems more signifieant than the creation of terrestrial life.

We must add here that some 20 years ago, F. Hoyle and N.C. Wickramasinghe claimed that a spectrum resembling that of bacteria could be seen in • the astronomical object GC-IRS7. (vol. 1, p. 179)

THE GANYMEDE MAGNETIC PARADOX

In December 1995, the Galileo spacecraft was injected into orbít around Júpiter, thereby becoming the first known artificial satellite of this giant planet. In the five years that have trans- pired, Galileo has radioed back volumi- nous data about Júpiter itself and its four large Galilean satellites. These natural satellites have turned out to be a disparate bunch. Three have iron cores, but Callisto breaks the mold with an unusual core of mixed ice and rock. Europa probably possesses an ocean, and Callisto might also. Only one of Jupiter's large satellites, Ganymede, boasts a magnetic field. In fact, Ganymede is appaíently the only satellite in the solar system to display an intrinsic, dipole magnetic field like the earth's.

Although Ganymede's magnetic field is Uke that produced by a permanent bar magnet, its core is much too hot for permanent magnetism. Again like the earth, Ganymede's field is theorized to be generated by the convection of elec- trically eonducting liquid in its core— a dynamo of sorts. All well and good, but Ganymede is so small that it should have cooled off billions of years ago thereby freezing its metallic core. So then, whence its magnetic field?

One way out of this box it to suppose that about a billion years ago Ganymede was circling Júpiter in an orbit that took it much closer to this ponderous planet. Then, Jupiter's powerful gravitational field would have gently kneaded Ganymede's structure creating what is called "tidal heatin,_ which kept the core liquid and able to generate a magnetic field.

(Johnson, Torrence V.; "The Galileo Mission to Júpiter and Its Moons," Scien- tifie American, 282:40, February 2000.)

Comment. Sounds good, but there is a puzzle piece missing: What catastrophic event catapulted Ganymede into its pre- sent orbit? It's as big as Mercury!

SATURN

TWO-FACED PLANETS AND MOONS

Several solar-system objeets present asymmetrical visages to our telescopes. Mars is a elassie case, being much more heavüy cratered in its Southern hemi- sphere than its northern. But the di- chotomies are not restricted to crater- ing, as we shall now see.

Iapetus. This satellite of Saturn is dark on one half and light on the other. Quantitatively speaking, the bright side

reflecta ten times more incident light than the other. An explanation is sug- gested by the fact that the dark side points in the satellite's direction of motion. A recent study of 12 Voyager images of Iapetus also imply an exogen- ous (externally imposed) origin of the dark surface, because they show a gradual rather than sharp transition between the dark and light regions. The thought of planetary scientists is that micro- meteoroids bombard the leading hemi- sphere of Iapetus preferentially and in the process volatilize considerable sur- face material. The residual deposit:

> may be an example of the dark, red- dish, possibly organic-rich material which is found on other satellites in the outer solar system and on the D- type asteroids.

(Buratti, Bonnie J., and Mosher, Joel A. ; "The Dark Side of Iapetus: New Evidence for an Exogenous Origin," Eos, 74:193, 1993.)

Comment. Here is still another hint that astronomical rather than terrestrial pro- cesses may perfora that basic chemistry essential for the origin and prosperity of life. Apparently, such prebiotic infrastructure is widespread in the solar system and, most likely, the entire uni- verse.

See also Mars (p. 64 and Neptune below.

NEPTUNE

SOLAR-SYSTEM PUZZLES

In the 30-or-so years that space probes have been visiting the 60lar system's other planets, mueh has been learned, but there are now more questions than ever. We now pose two of these----none of them could even have been asked before the space program.

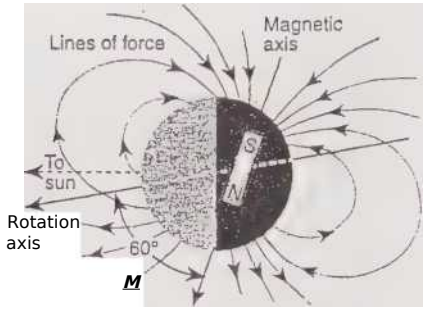
Question #1. Why are the magnetic fields of Neptune and Uranus tilted at such grotesque angles with the axes of rota- tion?

Proposed answer #1. Possibly because of giant impacts.

Question #2. "How can Neptune sustain 1400-kilometer-per-hour winds-----faster than Jupiter's—when it is so far from the sun, whose heat powers atmospheric circulation?"

Proposed answer #2. None given.

(Kerr, Richard A.; "The Solar System's New Diversity," Science, 265:1360, 1994)



Not only is the magnetic axis of Uranus tilted grotesquely crway from the planet's axis of rotation, but the axis itself lies álmost in Uranus' orbital plañe.

TWO-FACED PLANETS AND MOONS

Several solar-system objects present asymmetrical visages to our telescopes. Mars is a classic case, being much more heavily cratered in its Southern hemi- sphere than its northern. But the di- chotomies are not restricted to crater- ing, as we shall now see.

' Neptune. Recently, H.B. Hammel, using the University of Hawaii's 2.2-meter telescope, discovered that Neptune's northern hemisphere is now brighter than its Southern—something never observed before. During the past eight years, the Southern hemisphere has been consistently brighter, although the hemispheres were of roughly equal brightness during the late 1970s. The cause of these brightness changes rematas a mystery.

(Cowen, Ron; "Neptune's Northern Half Grows Brighter," Science News, 144:287, 1993)

Comment. See also Mars (p. 64) and Iapetus, a satellite of Saturn (p. 69).

SOLAR SYSTEM DYNAMICS

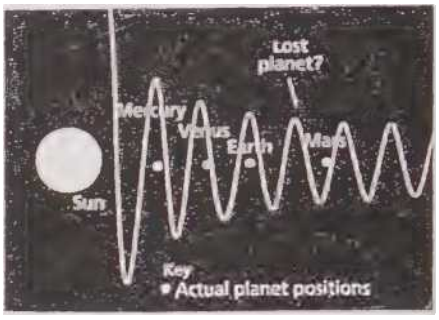
A VANISHED PLANET?

Almost every week, it seems, a new Texas- sized objeta is discovered in the outer solar system. In the tañer solar system, however, some astronomers are ftading "boles" where planets seem to have been ejected by unknown forces.
D. Christodoulou, I.ouisiana State Uni- versity, found one such "hole" serendipi- tously. He was studying how the sun and the planets might have condensed from the (hypothesized) cloud of primordial gas and dust. Factoring in gravity, rotation, and magnetic fields, he found the cloud condensing in concentric rings at just the right locations for proto- Mercury, proto- Yenus, and proto-earth. The fourth ring, however, did not cor- respond to any existing planet, and the position of proto- Mars was off the mark. But the asteroids and outer planets fell rather neatly tato place.

The implication of these calculations is that some turmoil in the early inner solar system cast out one planet and dislocated Mars.

(Hecht, Jeff; "Did Extra Planet Vanish tato Outer Space?" New Scientist, p. 18, June 14, 1997)

Comment. These are sour notes in the "music of the spheres," but don't be overly concerned; these are just calculations based upon many assumptions.



Calculated positions of rings of condensed dust and gas compared to actual planet locations.

THE SPHERES CAN DANCE TO CONVOLUTED MUSIC

A lot has been written about the "music of the spheres." But we don't hear much about this celestial music anymore; rather, "dances of the spheres" are in vogue.

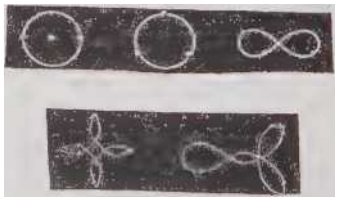
If only gravity and Newton's Laws ruled celestial motion, there would be no general solution to the hoary "three- body problem. But in the three special configurations illustrated, three bodies of equal mass can be shown to be stable. The third, the figure- of-eight, was not discovered until 1993 by C. Moore. Although mathematicians can prove it is stable, R. Montgomery admits:

> There is no understanding of why the orbit is stable, from either a physical or mathematical potat of view.

Certainly no figure-eight orbits have ever been observed in the cosmos so far, but who knows?.

The situation becomes really bizarre when more than three equal masses are considered. A few of the many stable, but manifestly weird, configurations are also illustrated here. These are among the simplest. To Alústrate, C. Simo has found a stable choreography for 799 bodies cavorting happily and stably together in space. And he was using only his laptop!

(Appell, David; "Celestial Swingers," New Scientist. p. 36, August 4, 2001)



SOLAR SYSTEM DEBRIS

METEORS

Meteors are our primary source of extraterréstrial matter. In this part of our compilation of potential' astronomical anomalies, we concéntrate on meteors in flight. If meteors land intact, they become meteorites and ' are treated beginning on p. 193.Meanwhile, we have divided our decadal collection of meteor phenomena into the foílowing four parts.

•Anomalous High-Altitude Luminosity (AHAL). Unexpected brightness at altitudes whére the atmosphere should be too thin to create the fric- tion required for lumiriosity.

•Anomalous Meteor Motion. Slow meteors, erratic trajectories, etc.

•Massive Aerial Detonations. Smaller than 1908 Tunguska Event, but surprisingly violent and recent.

•Miscellaneous Meteoric Phenomena. "Alien" meteors, possible meteor impacts with humans, curious processions, etc.

-8,Q -12.0 -
MAXIMUM ABSOLUTE MACNITUDE

Beginning heights of meteors observed by televisión camera versus máximum absolute magnitude.

Planetary Science, 35:243, 2000. Cr. R. Spaulding)

ANOMALOUS H1GH-ALT1TUDE LUMINOSITY (AHAL)

LEONID LUMINOSITY PUZZLE

Around November 17 every year, meteor-watchers strain to see the Leonids dart through the night sky. The Leonids are meteors that radíate from a point in the constellation Leo. The millimeter-size hits of debris that create this annual light show are tiny fragments discarded by the comet Temple-Tuttle that burn up high in the atmosphere. Astronomers are secure and comfortable with this explanation of the mid-November spec- tacle. Perhaps they shouldn't be.

In November 1998, an intriguing anomaly cropped up-----way up, 120 miles up! Leonids were seen to burn up at this altitude where there is not enough atmosphere to create the friction required to vaporize the space debris. Perhaps the cometary fragments from comet Temple-Tuttle are unusually vola- tile Perhaps there is something else going on at the ouíer fringes of the atmosphere. Who knows?

(Witze, Alexandra; "Scientists Gain In-sights into Meteors," Northwest Florida Daily News, May 27, 1999. Cr. B. Reid)

Comments. Sometimes, comets fiare up so far from the sun that solar heating is negligible. This poorly understood phenomenon may be related to the high-altitude flare-ups of the Leonids.

Some people elaim they can sometimes hear meteors hiss as they streak through the sky at altitudes so high that there is not enough air to convey sound! Sueh "electrophonic sounds" may have an electromagnetic origin; that is, some people perceive electromagnetic bursts as sounds. For more on these sounds, see our catalog Barthquakes, Tides . Unidentified Sounds.

WHAT'S UP THERE?

Some Leonid meteors are not behaving the way meteors should. They begin to burn up well above 100 kilometers where the atmosphere is too thin—essentially a good vacuum----to cause frictional heating and consequent vaporization. We mentioned this conundrúm briefly in the preceding digests. We now have the scientific details at hand concerning the supporting observations made during the November 1998 Leonid bombardment.

The observations were made by an International team in China. Photographic cameras were employed as well as an all-sky TV camera equipped with an image intensifier. All photographed meteors began to visibly burn up below 130 kilometers, but the TV camera con- sistently pieked up the same meteors at higher altitudes. Both sets of cameras recorded the same final burn-up heights. The most startling observation was a meteor that the TV camera detected at roughly 200 kilometers altitude.

> **The highest observed Leonid meteor with initial mass of about 1 kg started radiating at an altitude of almost 200 km. The origin of meteor radiation at such high altitudes is still not well understood and more detailed observations will be needed, including near-infrared spectroscopy.**

(Spurny Pavel, et al; "Atmospheric Be- havior and Extreme Beginning Heights of • the Thirteen Brightest Photographic Leonid Meteors...," Meteoritics and

ANOMALOUS HIGH ALTITUDE LUMINOSITY (AHAL)

When meteors plunge into the earth's upper atmosphere, friction with the air causes them to incandesce and burn up. The smaller ones are completely consumed. A few bigger ones reach earth and are renamed "meteorites." So far, all of this is well-understood. But when meteors begin to burn up much above 100 kilometers, a problem arises. The air there is normally much too thin to cause incan- descence and burn-up.

Observational anomalies are abundant. Two Leonid fireballs were seen glowing at 160 kilometers by Japanese scientists. In 1998, a Dutch team in China detected bright Leonids at 200 kilometers! In addition, some Russian reentering space-craft began glowing well above 100 kilo-meters. AHAL is a solid phenomenon.

Of course, the density of the upper atmosphere does inerease somewhat when solar activity is high. Atmospheric gra- vity waves can also cause the atmosphere to bulge out. But these effects are in-adequate to explain all observations.

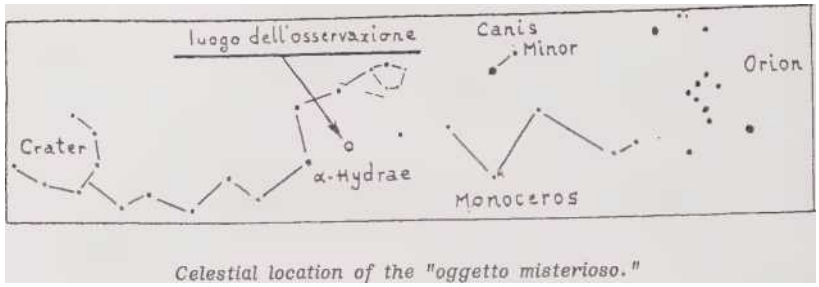
R. Spalding, at Sandia National Laboratories, ventures that ions in the upper atmosphere are eleetrostatically attracted to meteors and create light when they collide with them. A. Ol'khova- tov suggests that "plasma instabilities" may be involved. To learn more about these, go to the latter's web site at:

> **www.geocities.com/Cape Cañaveral/ Cockpit/3240.**

(Ol'khovatov, Andrei; "Anomalous High Altitude Luminosity," Meteorite, 6:18, May 2000)

Comments. AHAL remains unexplained. Interestingly enough, AHAL occurs at

the same high altitudes where some meteors are heard orí the ground, even though the air at these altitudes is too thin to transmit sound!



Celestial location of the "oggetto misterioso."

ANOMALOUS METEOR MOTION

UNEXPLAINED CELESTIAL PHENOMENA

B. Greenwood has been searching the back issues of Notiee to Mariners for unusual atmospheric phenomena reported by ships at sea. It's amazing how many enigmatic lights in the sky appear in ship's logs. Meteors, of course, are frequently seen, but they flash across the heavens in just a few seconds. If, in post-World War II days, a moving light persists for minutes, it might be a satellite or the pyrotechnies of a distant missile launch, some of which have pro- duced weird optical effects hundreds of kilometers away. From Greenwood's eol- lection we now reproduce two events that persist too long to be meteors and were also seen where rocket launches would have been unlikely (we think).

August 24, 1960. Mediterranean Sea. Aboard the M.V. Tarantel.

On August 24, 1960, in a position near Gavdo Island (34°50' N., 24°05' E.) on passage from Australia to Eu- rope, an object with the brightness and color of Aldebaran was observed. It was sighted at an altitude of 80° and traveled in a northeast direction for about 15 minutes to an altitude of about 15°.

(Jorgensen, K.; "Celestial Phenomenon," Notiee to Mariners, December 24, 1960, Cr. B. Greenwood)

May 13, 1960, North Atlantic. Aboard [*5]

the M.V. Margaret Johnson.

At about 1745 G.M.T., in lat. 10°53' N., long. 25°08' W., a bright light with a nebulous cloud as large as a full moon was observed at an altitude of about 20°-25° moving east- ward with a speed of about 90° in

5 minutes 30 seconds.

(Hulten, Captain; "Celestial Phenomenon," Notiee to Mariners, June 4, 1960. Cr. B. Greenwood)

UN OGGETTO MISTERIOSO

April 22, 1966. Genova and Novi di Modena, Italy.

We have just learned of this "mysterious object." Translation provided by P. Cortesi.

Near the star Alfa Hydrae (see illus- tration) appeared a perfect bright sphere, about 5° apparent diameter; it beeame largest in a few seconds, then it grew thinner and appeared like a line. In 45 minutes, its bril- lianee diminished progressively, and it disappeared at the western horizon.

From astronomical observations by some amateur astronomers were calcu- lated the following data: The object's altitude was between 600 and 650 kilometers above the earth's surface; at its biggest dimensión, the object was 95 kilometers wide; it was over the Mediterranean Sea, in a place between Algiers and the Baleario Islands.

No astronomer was able to explain the phenomenon, and the university astronomical review Coelum denomina- ted it "un oggetto misterioso" (a mysterious object).

(Anonymouss Coelum, 34:36, May-June 1966. Cr. P. Cortesi)

CHILEAN ASTRONOMER REPORTS UN- IDENTIFIED ATMOSPHERIC PHENOMENA

F. Noel is an astronomer at the National Astronomical Observatory located on the outskirts of Santiago. He is a véteran of hundreds of nights worth of stellar observations over almost 30 years. In the latest number of the Journal of Sci- entific Exploration, he reported some of his more perplexing sightings in the Chilean skies, two of which are related below:

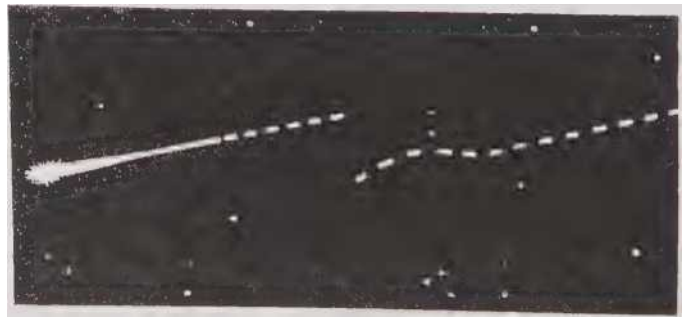
At approximately 22:30 local time on January 17, 1980, I was in front of my home in the eastern suburbs of Santiago de Chile. The sky was cloud- less, although there was some smog, especially in the west in the direction of downtown. Sunset had occurred at 20:55 local time.

At that time I observed a point- shaped luminous object at an eleva- tion of about 20 degrees; it was moving at a rather slow angular velo- city **from** Southwest **to** west approxi- mately. **No** noise **was** heard and it looked like an artificial satellite, **ex-** cept for the direction of its motion.

Its brightness, color and angular velocity reminded me of the oíd Echo artificial satellite from the 1960s. The object disappeared from sight during the few seconds it took me to cali two persons to particípate in the ob- servation. It was not apparent hbw the object had disappeared from view since there were no sources of ob- scuration evident. Having become puz' zled by this observation I continued watching that same región of sky frou time to time.

About fifteen minutes later (22:45 local time) and more or less in the same región where the bright light had been observed I spotted a faint luminous object moving slowly toward the zenith. During the first few seconds of observation it had the ap- .pearance of a luminous thread, orien- ted perpendicular to its direction of motion. However, as it approached the zenith, I could see that it was in fact a group of at least 30 lights distribuí ed in a broad, symmetrical V- configuration, reminiscent of a boom- erang. Three members of my family who were with me also observed the group of lights.

Each individual light of the group looked like a star of third or fourth magnitudes the color was a palé white similar to a neón light, with a slight tint of yellow. The brightness was rather steady, with no apparent flic- ker. The angular width of the group was about 4 degrees, and the central angle of the V was about 150 degrees. It was first visible about 20 degrees above the western horizon and disappeared at about that altitude in the east. The disappearance was gradual, probably as a result of atmospheric



October 20, 1879, Forest Gate, England, a meteor travels a zigzag path.

extinction. Since the group was in view for approximately two minutes, the mean angular velocity must have been a bit more than one degree per second. All these estimates are ap- proximate of course. No noise was heard during the observation.

Noel added that the Hghts maintained a rigid V-formation. He ruled out birds as the souroe of the phenomenon.

(Noel, F.; "Onidentified Atmospheric Phenomena Observed by an Astronomer," Journal of Scientific Exploration. 7:439, 1993)

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UNIDENTIFIED LIGHT

November 20, 1995. North Atlantic. Aboard the m.v. Uruguay Express en- route Santos to Bilboa.

At 0230 UTC a very bright light was noted on the port side about 50° from the bow, it lasted for about 5 seconds and then disappeared.

Knowing of no bright star in that position, the observers checked the area with binoculars and saw two small lights which were as bright as a star of very small magnitude, tra- velling at a very fast rate and at a steady distance from each other. No navigation lights were seen. One light then disappeared and the other changed course upwards before dis- appearing about 3 seconds later, neither objeet left a trail.

The sky was cloudless and visibility was good. The vessel was about 200 miles south of the Cape Verde Islands.

(Chiappara, H.; "Unidentified Light," Marine Observer, 66:186, 1996)

Comment. Another maddening, elusive, UFO-like sighting, of which there are many from similarly reliable sources.
One wonders what caused the initial "very bright light."

UNIDENTIFIED LIGHT

May 4, 1997. North Atlantic Oeean. Aboard the s.t.s. Astrid enroute from the Azores to Dartmouth.

At 0443 UTC a light was sighted high in the sky above the ship. The light was of the style of a satellite in ap~ pearance. However, it was seen for about 10-15 seconds moving west to northwest, with a pulsating white light. In addition, it was moving very fast and it also stopped dead a couple of times.

At one point, the light stopped and turned in the direction of the ship. The light no longer pulsated, and for about one second it was in the form of a spotlight lighting the surrounding area. The light then turned back again and moved very, very fast across the sky before it was lost below the horizon in a matter of seconds.

(Ulrich, G.; "Unidentified Light," Marine Observer, 68:64, 1998)

Comment. The erratie rnotion and use of a searchlight are typical of some of the UFO reports seen in newspapers. How- ever, the Marine Observer is a publica- tion of the UK Meteorologieal Office and the observations it prints come from ships' logs.

In the above "encounter," aircraft, satellites, and meteors do not fit the testimony of the observers.

MASSIVE AERIAL DETONATIONS

TARGET EARTH

A February article in Sky and Telescope begins:

> Military satellites have been watching huge meteoroids slam into the Earth's atmosphere for nearly two decades.

Secret until recently, infrared scan- ner data from military satellites have detected 136 atmospheric explosiona since 1975 with yields of 1 kiloton or more. There may actually have been as many as four times this number, because the satellites are programmed to look for unnatural energetic events, such as nuclear detonations. They often ignore extraterrestrial projectiles.

Why aren't earthbound observers aware of all these atmospheric explo- sions? Because most are infrared events; few emit enough visible light to attract the attention of ground-based observers. However, two of these "secret" meteoric events might explain some Fortean phenomena recorded over the last two centuries.

April 15, 1978. Over Indonesia. A military satellite watched a colossal day- light fireball that, for one second only, would have rivaled the sun to anyone watching from the ground below and alert to such phenomena. The TNT yield was estimated at 5 kilotons.

August 3, 1963. Between South Africa and Antárctica. A huge airburst equiva- lent to a 500 kilotons was picked up by a worldwide network of acoustic detec- tors. The cosmic interloper this time was believed to have been a small aster- oid about 20 meters in diameter.

(Beatty, J. Kelly; "'Secret' Impacts Re- vealed," Sky and Telescope, 87:26, February 1994. Cr. P. Huyghe. Broad, William J.; "Meteoroids Hit Atmosphere in Atomic-Size Blasts," New York Times, January 25, 1994. Cr. J. Covey)

Comment. The Indonesian event mention- ed above may be associated with the many recorded instances of transient brightenings of the entire sky (See our catalog Remarkable Luminous Phenomena.) .

The 1963 acoustic event might be re- lated to the many mysterious booms or detonations heard down the decades, long before jet planes offended our ear- drums (See our catalog Earthquakes, Tides, Unidentified Sounds.).

HUGE FIREBALL EXPLOSION IN 1994

TlúB remarkable event was mentioned by C. Keay in his review of D. Steel's book Rogue Asteroide and Doomsday Comets. It seems to have escaped or been ig- nored by the scientific press. We quote from Steel's book, in which he com- plains that such events get little publici- ty despite their ominous impiications for the future of humanity.

> It is therefore not surprising that the 10-meter-or-so asteroid that blew up over a largely vacant area of the western Pacific on February 1, 1994, producing an explosión equivalent to at least ten times that of the Hiroshima bomb (and possibly rather more), was not seen prior to impact. Surveillance satellites registered it as the brightest such explosión that they have picked up so far. Despite the efforts of numerous scientists in this area of study to make the military aware that such detonations do occur naturally, it appears that the U.S. President was awakened be- cause the Pentagon thought that this incident might be a hostile nuclear explosión.

(Keay, Colin; "The Non-Denominational Day of Reckoning," The Skeptic, 15:44, Spring 1995. This journal is published in Australia and should not be confused with the UK journal of the same ñame.)

TARGET: GREENLAND

December 9, 1997, Greenland.

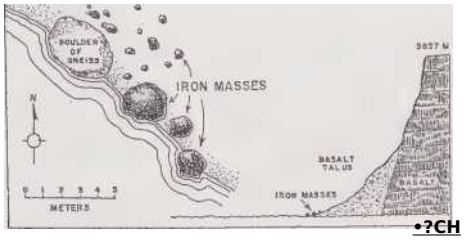
At 5:11 A.M., crews of three trawlers at widely separated sites off south Greenland reported "a blazing fireball that turned night into day." At a distance of 100 kilometers (62 miles), the flash was compared to that from an atmospheric nuclear explosión. Danish officials dismis sed the possibility of a surreptitious nuclear test. The U.S. Air Forcé stated that the objeet was neither a reentering spacecraft ñor artificial space debris. Some seismic tremors also emanated from Greenland, so the impact of a lar ge meteorite is suspected. Based on the visual sightings and a moving objeet caught on a parking-lot surveillance camera in Nuuk, Greenland's capital, the probable impact point is at 61°25' N. 44°26' W. Efforts to lócate the meteorite will have to wait for favorable weather.

The supposed meteor was not a small objeet. The Niels Bohr Institute in Copenhagen compared it to the Kap York meteor that fell south of Thule, Greenland, in prehistoric times. Pieces of this iron meteorite aggregating 50 tons have been collected.

(Sawyer, Kathy; "Fireball a Mystery tül Thaw," Charlotte Observer, December 22, 1997. Cr. G. Fawcett via L. Farish)

Comment. It is our understanding that the search for this presumed meteorite in Greenland was fruitless.

SHORE OF DISCO ISL.



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The Greenland ice, like that of Antárctica, has preserved numerous meteorites until humans could find them. The three large iron meteorites illustrated above were found on Disco Island, Greenland, in 1870. Weights: 20, 10, and 5 tons. Disco Island is about 600 miles southeast of Kap York,

TUNGUSKAS FOREVER

S. Worden of the U.S. Space Command has stated that two aerial detonations similar to the 1908 Tunguska blast have occured sinee 1908. The first (presumed) asteroid blew up over the Amazon in the 1930s;. the second exploded over Central Asia in the 1940s.

(Hecht, Jeff; "US Military Wakes Up to Asteroid Risk," New Seientist, p. 12, August 17, 2002.)

Comment. Our literature searches have so far found nothing about the Central Asian event, but of the 1930s phenomenon there is plenty. It took place over the Brazilian Amazon on Mareh 3, 1930, when three flery objects depopulated about 100 square miles of jungle. See p.177 for the fantastic details. The same issue of Science Frontiers mentions similar event over Guyana in 1935 and another in northeastern Brazil in 1995.

Aerial phenomena and curious craters appeared at the border between Honduras and Guatemala in 1966 and in Spain in 1934. (p. 177)

Also on p. 177 note a shallow cráter in South America that is of more than ordinary interest.

MISCELLANEOUS METEORIC PHENOMENA

ALIEN METEORS

Meteors or shooting stars are usually eonsidered to be small fragmente that have been broken off the asteroide ply- ing orbits between Mars and Júpiter. If this belief is correct, meteors darting into the earth's upper atmosphere would have speeds less than 260,000 kilometers per hour. Any objects with significantly higher velocities must come outside the solar system. It has, therefore, been unsettling to find that quite a few meteors hit our atmosphere at speeds much higher than 260,000 km/hr. Radar measurements of 160,000 meteors by A. Taylor and colleagues, at a New Zealand site, found that about 1% (1500 meteors) struck the atmosphere with velocities greater than 350,000 km/hr.. These speedsters must come from beyond the solar system. The question arising is: Whence all this Ínterstellar debris? One hint comes from the fact that the aliens appear to come from the direction in which the sun and its family of planets are traveling through interstellar space. Evidently, this interstellar médium is far from a vacuum; it is strewn with flotsam and jetsam---but from what smashed planets, moons, and asteroide?

(Samson, Alan; "Radar Traps Visitors from Outer Space," Dominion Sun Times (Wellington), April 25, 1993. Cr. P. Hassall)

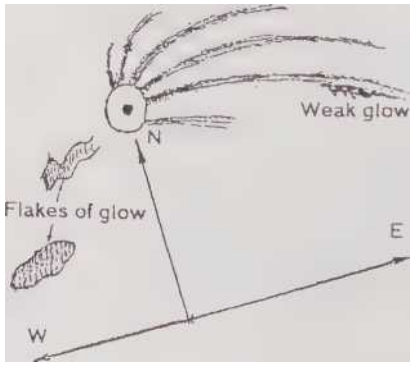
THE PETROZAVODSK PHENOMENON

We classify this remarkable phenomenon under ASTRONOMY because in several respects it parallels some meteoric phe- nomena, such as the famous February 9, 1913, bolide procession that amazed inhabitants of eastern North America. Unhappily, we only have room to quote one paragraph from a 10-page report.

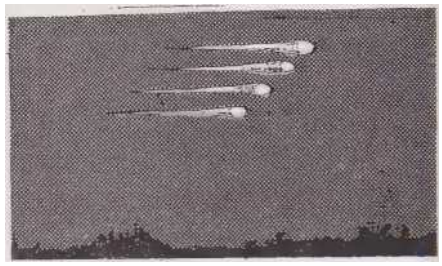
> **General outline of the phenomenon. At night, early on the 20th of Sep- tember of 1977, over a vast area in the northwest of the European part of the USSR, unusual light phenomena in the atmosphere were observed, namely formation and motion of bright, luminous bodies surrounded by ex- tended shells and emitting light rays or jets of quaint shapes. The shells transformed and diffused within 10 to 15 minutes. Besides, a more long- lived, stable glow was observed, mostly in the northeastern part of the sky. These phenomena took place during disturbances of the geomagne- tic field and the upper atmosphere. Somewhere, aurora borealis was seen.**

(Gindilis, L.M., and Kolpakov, Yü.K.; "The Petrozavodsk Phenomenon," RIAP Bulletin, 2:3, April-September 1995.
RIAP = Research Institute of Anomalous Phenomena, published in Ukraine)

References. The aforementioned 1913 meteor procession is described our cata- log The Sun and Solar System Debris. Also see: vol 1., p. 76.



The Petrozavodsk phenomenon as seen near Lehta.



Some meteor "formations" during the great 1913 procession across eastern North America.

METEORITE OR MINIATURE BALL LIGHTNING ----------OR SOMFTHING ELSE?

September 3, 1900. Mobile, Alabama.

A letter from T.T. Roche to the Editor of the Scientifíc American Supplement.

> **On last monday night (September 3) the weather was so cióse and hot that I had lain down in the hammock under the big walnut tree in front of the house, Sister M. had taken a seat in the center of the lawn, quite out of the shelter of the tree. I was lying in such a manner that we were directly facing each other, only a few yards apart. Sister was sitting with her arms stretched out and res- ting on the arms of a large armchair. While we were talking I saw a meteor descending to the earth directly over her head. It was quite brilliant at first, but grew fainter as it carne nearer, until just as it seemed to reach her, it was about the brilliancy of a large, a very large 'lightning bug' or firefly. At the moment when I tried to caU out to her that a meteor was descending cióse by, she lept to her feet, screaming that she had been shot in the arra.**
>
> **I sprang up and ran to her, and on examining the arm we found a smaU red spot just above the elbow, which rapidly grew larger, and rose, a blister forming almost at once. It was exceedingly painful and had all the appearances of a fresh burn. The arm swelled, and the place made a quite painful sore. At present (four days later) it looks exactly like an oíd vaccination, being quite deeply pitted. On examining the dress, we found the sleeve scorched and burned through, in a tiny hole, just over the spot where the wound is.**

(Anonymous; "Struck by a Fragment of a Meteor," Scientifíc American Supplement, 49:20125, 1900)

Comment. No science publication today would publish such an account, although there would be no hesitation in printing articles about miniature black lióles hit- ting the earth!

INTERPLANETARY DUST

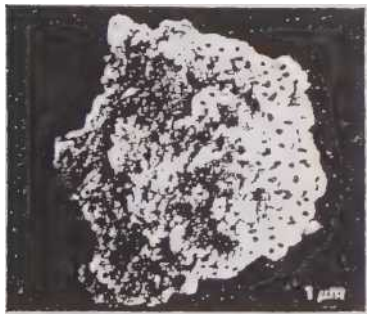
FROM DDST UNTO DUST

This Biblical assertion may be right on the mark, but in a sense that is slightly different from what is usually meant.
The "first" dust may not have been terrestrial dust but interplanetary dust.

Let us commence with long-winged U2s cruising at 20 kilometers altitude or more. Collectors eoated with silicone oil are deployed. To them stick tiny bits of interplanetary and interstellar debris that have been caught by earth's gravi- ty and are slowly drifting downward in the atmospshere. Some of these micron- sized partióles come from asteroid colli- sions; others from the disintegration of comets. This rain of cosmic matter is not negligible; the earth harvests about 40,000 tons annually from the fertile fields of outer space.

"Fertile?" Yes, outer space is a vast biochemical retort. D. Brownlee, R. Wal- ker, and others:

> **... suggest that interplanetary dust has probably carried organic matter to Earth since the early aeons of the solar system. The complexity of the organic molecules found on these partióles has fueled the imaginations of many who ponder the role extra- terrestrial matter may have played in the prebiological evolution of organic material on the primordial Earth.**



Scanning electrón micrograph of a 20- micron chondritic interplanetary dust partióle.

Beyond these conjectures, several other things about interplanetary dust particles bother scientists:

> **"What is surprising," Walker notes, "and still not understood, is the fact that the organic molecules we see in the dust particles are different from those previously seen in meteorites." Another enigma is the observation of striking isotopic anomalies-----large enrichments of deuterium relative to hydrogen, as much as ten times greater than one sees in terrestrial samples—in the particles in which Zare's group observed the organic molecules.**

> **Yes, the original dust of life may have been extraterrestrial.**

(Zeman, Ellen J.; "Complex Organic Molecules Found in Interplanetary Dust Particles," Physics Today, 47:17, Mareh 1991)

Comment. Nature it seeras is a great re- cycler. It was Walt Whitman who wrote:

> **And as to you, Life, I reckon you are the leavings of many deaths.**

A SAGA OF SOOT IN THREE PARTS

Part I. The tale began on March 27, when Comet Hyakutake passed within 15 million kilometers of earth. At this point in its trajectory, it carne into the field of view of the X-ray astronomy satellite ROSAT. ROSAT was designed to look at stars whose extremely high temperatures can generate X- rays. It seemed ridicu- lous to point ROSAT's instrumenta at a comet composed mainly of ice and dust. How could a comet emit X-rays? When a Germán-American team of scientists pro- posed taking a peek at Hyakutake with ROSAT, scientiñc eyebrowns were raised. What a waste of observing time!

At the most, the team thought they might pick up a smudge of weak X-rays where dust grains flying off Hyakutake collided with dust grains normally pre- sent in interplanetary space. The team did get ROSAT to take a look, and what the satellite saw ignited a controversy.

Some 50,000 kilometers in front of the comet was a bright crescent of X-rays, 100 times brighter than the brightest "smudge" the team of scientists had hoped for. This was completely unex- pected. All astronomers could do was come up with three rather unconvincing theories: (1) Solar X-rays were absorbed and reemited by the comet (X- ray fluoreseence); (2) Cometary material emitted X-rays when bathed in the solar wind; and (3) Charged particles were somehow accelerated by a magnetic field compressed by the comet's bow wave in the solar wind. Nobody is particularly happy with any of these theories.

(Hecht, Jeff; "Comet Bids Farewell with Blaze of X-rays," New Scientist, p. 18, April 20, 1996. Glanz, James; "Comet Hyakutake Blazes in X-rays," Science, 272:194, 1996)

Comment. Serendipity has Btruck again! Imagine all the phenomena we are missing because we know they can't happen!

Part II. Shortly after Hyakutake's X- rays were announced, a fourth theory of origin was put forth by acknowledged heretics C. Wickramasinghe and F. Hoyle. Comet Hyakutake, they said, was not emitting X- rays itself. Instead, solar X-rays were mirrored in earth's direction by a cloud of very tiny carbon-contain- ing particles released by the comet. Elec- trons in these nanometer-sized particles acted as if they were free electrons, and these are excellent scatterers of X-rays. Anyone familiar with the writings of Hoyle and Wickramasinghe can guess what these nanometer-sized particles might be: viruses, of course!

Said Wickramasinghe:

> **It aU fits in the the idea that there are real viruses in comets and that comets are the agenta by which life is brought to planets.**

(Chown, Marcus; "Do X-ray Comets Shed Carbón?" New Scientist, p. 19, May 11, 1996)

Part III.

> **For the first time, researchers have found complex organic molecules on the Earth that carne from outside the Solar System. American scientists say tiny sooty grains extracted from meteorites contain polycyclic aromatic hydrocarbons (PAHs) from interstellar dust clouds.**

This article continúes with an acknow- ledgement that F. Hoyle did predict way back in the 1950s that some of earth's organic matter carne from outer space. And that he was roundly scoffed at.

Next, more evidence is presented suggesting that the universe is fuH of the basic ingrediente of life: Recently, the spectrum of the amino acid glycine was detected near the center of our galaxy.

(Hecht, Jeff; "Stardust Brought Down to Earth," New Scientist, p. 17, March 23, 1996)

Cross reference. o_n p. 194 $_{we}$ relate how PAHs were found m meteorite ALH- 84001, which was picked up in the Ant- arctic, and which is believed to have originated on Mars.

COSMIC SOOT

Just as we were getting used to carbon- • aceous chondrites and tarry comets, we have been hit with cosmic soot and organic asteroids. Truly, it seems as if the universe is one vast factory of complex Chemicals. This is not a trivial observation, for it betrays a synthesizing, efflorescent cosmos rather than a universe slowly succumbing to the deep- freezing Second Law of Thermodynamies. Any of these soots and tars wafting down upon the surface of a suitable planet might initiate or accelerate life processes.

Cosmic soot. A 70-year-old astronomical enigma is the origin of the DIBs (Dif- fuse Interstellar absorption Bands). These dark absorption bands in stellar spectra have never been correlated with known Chemical compounds. Now, L. Allamandola and F. Salama (ÑASA-Ames) find that the DIBs may be due to polycyclic aromatic hydrocarbons! A more digestible descriptor would be "soot," like that found in automobile exhaust and on your barbecued steak.

(Weiss, Peter; "Cosmic Soot FHls Space between the Stars," New Scientist, p. 15, March 13, 1993)

Reference. See p. 78 for "organic asteroids.

"NOT WITH A BANG BUT A WHIMPER"

Poet T.S. Eliot speculated that life on earth might not after aH be terminated catastrophicaHy, as in the impact of a large asteroid (today's popular doomsday machine). Rather, we might depart slow-

ly, quietly, and mournfully. Of eourse, Eliot was not thinking of asteroids------ no one foresaw impact havoc in his day. But, his use of the word "whimper" can be attaehed to another, much slower astronomical agent of planetary death: cosmic dust and gas. Here's the current situation:

> For the most part of the past five milUon years, the Solar System has been moving through a rather empty región of interstellar space between the spiral arms of the Milky Way. But a few thousand years ago, it entered a diffuse shell of material expanding outward from an active star-forming región called the Scorpius-Centaurus Association. Such "super-bubble" shells of gas and dust result from the formation of massive stars, or the explosión of those stars as they become supernovas, and contain gas and dust clouds of varying densities.

The density of matter in this solar-system-engulfing shell could well shroud our planetary system with dust and gas a million times more dense than that we now encounter. If this happens, the sun's rays would slowly dim and life forms dependent on photosynthesis would expire. P. Frisk, a Dniversity of Chicago astronomer, forecasts a "bumpy ride" for earth dwellers during the next 50,000 years; but we think Eliot's "whimper" is more expressive of what might happen.

(Jayawardhana, Hay; "Earth Menaced by Superbubble," New Scientist, p. 15, June 22, 1996)

Comments. A possible precursor of things to come was the enigmatic "Siber- ian Darkness" of September 18, 1938.
(See our Report #7, photocopied classics series. Also: our catalog Tornados, Dark Days, etc.)

Science fiction writers have not neglected the "whimper-death" idea:
F. Hoyle's The Black Cloud and H.G. Wells' In the Days of the Comet.

ASTEROIDS

Thousands of asteroids ply the classical "belt" between Mars and Júpiter. In recent years, however, a second belt of asteroids beyond Neptune has been recognized. It is termed the Kuiper Belt and its occupants are suprisingly large and numerous. In astronomical short- hand, they are termed KBOs (Kuiper Belt Objects) or TNOs (Trans- Neptunian Objects).

Another advance in ásteroid Science carne during the 1994-2004 decade when spaceraft obtained close-up pictures of ásteroid surfaces. The photos demonstrated that asteroids are definitely not monophyletic! We attend to some of these eye-opening discoveries in the second group of digests that follow,

•Asteroid Celestial Mechanics. Kuiper-Belt Objects, potential Planet-Xs.

•Asteroid Geology. Some asteroids are rübble piles; others seem solid objects sometimes covered with large boulders and curious "beaches" and "ponds."

ASTEROID CELESTIAL MECHANICS

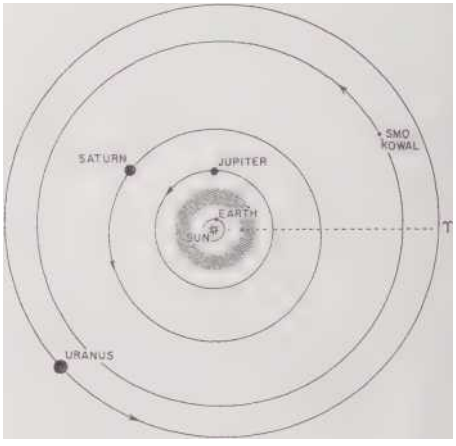
A NEW CLASS OF SOLAR SYSTEM OBJECTS

For decades astronomers have suspected and searched for Planet X, a large body beyond Neptune swinging slowly about the sun and gravitationally perturbing Neptune's orbit. Planet X has never been found, but somewhere out there are some pretty hefty bodies, as deseribed by T. Van Flandern:

> The discovery of a second mini- planet beyond Neptune, 1993 FW, augraents the discovery of 1992 QB1 last fall, Both objects are believed to be in the 200-300-km-diameter range, with magnitudes between 2324, distances at discovery between 40-45 AU, and low inclinations.... Although the discoverers of these two objects hailed them as the first repre- sentatives of the elusive "Kuiper belt" of coraets, other theoreticians have confirmed that the line of reasoning leading to the suggestion of such a belt is spurious. That fact, combined with the absence of any comet-like characteristics in these two new objects, their relative size as compared with any other known comet, and their unusualiy red coloration, seem to make them the first-discovered members of a new elass of solar System bodies. Since the searches leading to their discovery have examined only 1.5 out of tens of thousands of square degrees of sky wherein such objects might be discovered, it seems a reasonable conjecture that thou- sands of additional similar objects will ultimately be found. In short, it appears at this early stage that the solar system may have a second asteroid belt beyond Neptune.

(Van Flandern, T.; Meta Research Bulle- tin, 2:13. June 15, 1993)

Comment. Did this new elass of objects once comprise Planet X? If there are truly thousands of such bodies with dia- meters of 200-300 kilometers circling out there beyond Neptune, the astronomers will be hard put to account for them, and the astrologers will have to modify their calculations! What's going on here? How could astronomers completely over- look a major component of the solar system? Paradigm blinders?



One of the first recognized TNOs was the ásteroid Chiron, origindlly named SMO Kowal. Its orbit lies far beyond that of the classical ásteroid belt.

2000 CR_{105} AND PLANET X

2000 CR^Qg is a supercomet some 400 kilometers in diameter. It is one of hun- dreds of icy TNOs (Trans-Neptunian Objects) that normally popúlate the Kuiper Belt girdling the solar system just beyond the orbit of Neptune. The problem is that 200U CR^Qfj is not normal. Its orbit is highly eccentric, with an ap- helion 13 times farther out than Nep- tune's. This massive object (probably mostly ice) takes 3175 years to circle the sun. 2000 CR_{J05} is real; it has been photographed; it is not Mirror Matter; no one blames any terrestrial extinctions on it. Nevertheless, we can and must won- der how its orbit became so badly dis- torted.

■

Often in past years, whenever astro- nomers detected cometary orbits gone awry, they invoked Planet X; that is, some undiscovered massive body plying the outer reaches of the solar system. Indeed, there have been several intense and unsuccessful searches for Planet X over the years. (See our catalog The Sun and Solar System Debris.)

History seems to be repeating itself with 2000 CR^gg, Astronomer B. Gladman proposes that 2000 CRj^g was forced into its present eccentric orbit by an encounter with a Mars-size Planet X that now orbits the sun at a distance about 15 times that of Neptune. From the stand- point of celestial mechanics, this pertur- bation of 2000 CR-^gg's orbit is certainly within the realm of possibility. But two associated problema worry astronomers:

(1) The aeeepted theory for the formation of the solar system does not countenance the formation of planets the size of Mars so far away from the sun; and

(2) If this newly postulated Planet X truly exists, why has it not ejected more 2000 CRjggs from the well-populated Kuiper Belt over the billions of years Planet X has been perturbing the Belt ?

(Schilling, Govert; "Comet's Course Hints at Mystery Planet," Science, 292; 33, 2001)

WHAT'S BEYOND THE KUIPEK CLIFF?

The Kuiper Belt hosts a multitude of icy bodies, some being over 1,000 kilometers in diameter, The existence of this Belt was suspected as far back as the 1940s by K. Edgeworth and, of course, G. Kuiper. But these icy objects orbit be- yond Neptune and are hard to see. They long played second fiddle to the classical asteroid belt circulating between Mars and Júpiter. But, by the 1980s, astrono- mers had to admit that some comet-like objects originated-----not in the hypothetical Oort Cloud—but in the región between 30 and 50 A.ü.j that is, from the edge of Neptune[1] s orbit to 50 times the earth's distanee from the sun. This recently recognized "Kuiper Belt" of unappreciated multitudinous objects dis- plays two features of interest to anoma- lists. ' . _

First, there exists a Kuiper-Belt "cliff" located at about 50 A.U. Beyond this distanee, the population of Kuiper- Belt Objects (KBOs) drops off precipi- tously. Three explanations of this "cliff" have been proposed:

(1) The Kuiper Cliff is "just there"; that is, the Belt was formed with this eharacteristic. However, the origin of the Belt itself is not clear.
(2) The gravitational pulí of a passing star swept the región beyond 50 A.U. clear of debris. This is always a safe surmise. But what would such a near miss have done to the more distant Oort Cloud of comets?
(3) The trans-Kuiper Belt región was instead swept olean by a still-undetected member of the solar system that has long been suspected and, appropriately, named Planet X.

Astronomers seem to prefer the third explanation. So, too, do science-fiction writers and ufologists, because Planet X provides an ideal, cryptic staging area for forays to earth!

Computer-modeling of the Kuiper Belt and its cliff suggests that Planet X should be about the size of earth or, perhaps, Mars.

The second salient feature of the Kuiper Belt is its constitution. Some 700 KBOs have already been identiñed—the bigger objects, of course. But one estímate puts the total population of objects over a kilometer in diameter at 10 billion. The combined mass of all KBOs equals 0.2 that of earth and is 1,000 times that of the long-recognized asteroid belt. If Pluto (probably really a KBO) retains its planet label, the solar system really boasts about 500 planets, all save 8 in plying the Kuiper Belt along with Pluto!

What are the KBOs made of? The answer is astonishing and perhaps profound in its implcations: The Belt contains most of the solar-system's water and organic molecules.

(Couper, Heather, and Ilenbcst, Nigel; "The Hunt for Planet X," New Scientist, p. 30, December 14, 2002.)

THE ALIEN PLANETS

A mainstream astronomer would certainly tag Mercury and Pluto as the "alien" planets of the solar system. The former's orbit is grotesquely awry (high eccentri- city and inclination); the latter is not a planet at all, being merely a Kuiper Belt Object (KBO)—in other words, an asteroid.

But another school of thought main- tains that it is the other seven "well- behaved" planets that are the true aliens. Sure, all of these seven circle the sun in almost exactly the same plañe. But this plañe is inclined 7.25° to that of the sun's plañe of rotation. That's just too much for some astronomers. How could these seven planets have cohered from the same nebular disc of matter as the sun? Besides the outer planets----the giant ones----are too far from the sun for the nebular hypothesis to have seeded them. These seven planets between Mercury and Pluto—or the matter that formed them—must have originated elsewhere in the cosmos and been later captured by the sun.

(Anonymous; "The Word Cosmogonist," New Scientist, p. 49, September 28, 2002)

Comment. Besides that embarrassing tilt between the sun's angular momentum vector and that of the collective planets, there aleo exists a hard-to-accept angular- momentum ratio of 1:180. Virtually all of the solar-system's angular momentum is possessed by the miniscule planets that circle the massive sun. Very strange!

NOT ENOÜGH TNOs

TNOs (Trans-Neptunian Objects*) are lar ge lumps of dirty ice orbiting the sun in the so-called Kuiper Belt just beyond Neptune. The Kuiper Belt with its inventory of TNOs was not even recognized by astronomers until a few decades ago. By then, it was obvious to the comet-counters that the large number of short-period (less than 20 years) comets they were tallying could not come from the hypothesized Oort Cloud at the far fringes of the Solar System.

Sure enough, when astronomers searched the Kuiper Belt región, they found some fairly large objects, some almost planet-size. Pluto, in fact, may

a TNO, ,

A problem that has now arisen deyes from a faint-object search of a lall section of the Kuiper Belt with e Hubble's Advanced Camera for Sur- :ys by a team led by G.M. Bernstein id D.E. Trilling. What they saw and ,unted is "wildly inconsistent" with te number of short-period comets that •e observed. In fact, the team found íly 4% of the number of objects that leory had predicted.

Conclusión: the size distribution of NOs deviates from theory because the ny expected larger TNOs were pulver-

- - nrvma (inwnnnfTtl(ZPfí P.VBTlt or process at some time in the Solar Sys- tem's long history. Another possibiüty is that the missing large TNOs were once merely loose rubble piles of ice chunks that were gravitationally torn apart and dispersed.

A survey for even fainter TNOs may decide what really did happen. In any case, the history of that región of the Solar System needs some radical rewriting.

(Schilling, Govert; "Comet 'Factory' Found to Have Too Little Inventory," Science, 301:1304, 2003. Cowen, R.; "Hubble Highlights a Riddle," Science News, 164:148, 2003.)

*TNOs = KBOs (Kuiper-Belt Objects)

THE EARTH'S SECRET COMPANION

It's only 5 kilometers across and no threat to our moon's dominión of the night sky. It's also in an orbit that is highly inclined to the plañe of the ecliptic and, therefore, unlikely to impact the earth and wipe out today's imperial dinosaurs (us!).

Be that as it may, Asteroid 3753 shares the earth's orbit. It is gravitationally attached to one of the earth's Lagrangian points, which are in essence gravitational eddies that collect cosmic debris from the celestial maelstrom. The more important Lagrangian points lead and follow the earth in its orbit by 60°. Asteroid 3753 is probably only tempora- ily affianced to earth. Such objects are fickle and may depart at the slightest gravitational nuance. 3753 plies a peculiar "horseshoe" path. It is likely accom- panied by other celestial flotsam and jet- sam.

(Murray, Cari D.; "The Earth's Secret Companion," Nature, 387:651, 1997. Wiegert, Paul A., et al; "An Asteroidal Companion to the Earth," Nature, 387: . 685, 1997)

Comment. Strangely, no one has yet claimed that 3753 is really an alien space- ship loitering at the Lagrangian point while it beams up and studies selected earthlings!

More seriously, the subject of "other" small, natural "companions" (true satel- lites) of the earth has a long history. Not only are there visual observations of suspicious objects but also radio-propa- gation anomalies and other phenomena that may be linked to such objects. See our catalog The Sun and Solar System Debris. See also vol. 1, p. 57.

MOONSTONE IN ORBIT?

A chunk of "something" about 50 meters across plays tag with the earth as it circles the sun. Discovered February 10, 1999 by an automated, ásteroid-hunting telescope in New México, the object's official ñame is 1999 CG9. Its orbit is nearly circular and 9 million kilometers farther away from the sun than the earth. Its year is 1.09 earth years.

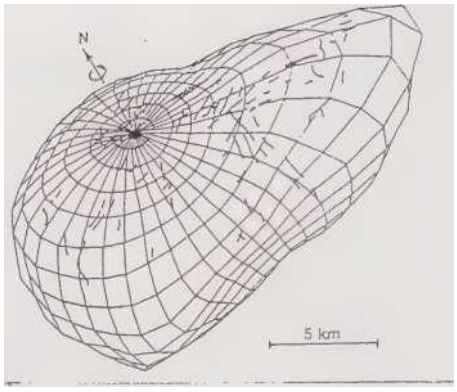
The object's orbit is extremely unusual. Comets and asteroids that cross the earth's orbit normally have eccentric orbits. There is only one asteroid-like object, called 1991 VG, that has an

similar orbit to that of earth. When it was discovered eight years ago, astro- nomers thought it might be a space- craft that had escaped the earth's gravity.

However, newly discovered 1999 CG9 is much too large to be a wayward piece of space hardware. The best guess is that it is a piece of the moon that was knocked off by an impacting áster oid.

(Hecht, Jeff; "Chip off the Moon," New Scientist, p. 13, February 27, 1999)

Comment. Might it not be a chip off the earth itself? Or perhaps space hardware from somewhere else?!



Shape-model of the asteroid Gaspra showing the locations of the major grooves mapped so far.

ASTEROID GEOLOCY

ORGANIC ASTEROIDS

Some asteroids are abnormally red. Newly discovered asteroid 5145 Pholus is 3i times brighter at near-infrared wavelengths than it is in the visible portion of the spectrum. The best explanation so far for this redness is that 5145 Pholus is veneered with organic compounds called "tholins." Tholins are synthesized when methane and other simple Chemicals are bathed in ultraviolet and particulate radiations. Tholins have even been dubbed the "first foods" of aspiring new life forms!

(Anonymous; "An Organic Asteroid?" Sky and Telescope, 85:15, 1993)

THE SHATTERING OF 951 GASPRA

951 Gaspra is an irregular asteroid with an average radius of 6.1 kilometers. Located at the inner edge of the main asteroid belt between Mars and Júpiter, Gaspra is believed to be composed mainly of olivine, pyroxene, and nickel-iron.

On October 29, 1991, the Galileo spacecraft swept past 951 Gaspra at a distance of 1600 kilometers, snapping photographs as it went. J. Veverka et al report below on what the photos showed:

> We report the discovery of grooves in Galileo high-resolution images of Gaspra. These features, previously seen only on Mars' sateUite Phobos, are most likely related to severe im- pactB. Grooves on Gaspra occur as linear and pitted depressions, typi- cally 100-200 m wide, 0.8 to 2.5 km long, and 10-20 m deep. Most occur in two major groups, one of which trends approximately parallel to the asteroid's long axis, but is offset by some 15°, the other is approximately perpendicular to this trend. The first of these directions falls along a family of planes which parallel three extensive fíat facets identified by Thomas et al. The occurrence of grooves on Gaspra is consistent with other indications (irregular shape, cratering record) that this asteroid has evolved through a violent collisi- onal history.

(Veverka, J., et al; "Discovery of Grooves on Gaspra," Icarus, 107:72, 1994)

Comment. The pits along Gaspra's cracks, as on Phobos, suggest the violent expulsión of gases. Where could these gases have come from? "Sandblows" are sometimes formed during terrestrial earthquakes as natural gases and other fluids are squeezed out of the earth's porous outer crust. Could Gaspra har- bor primordial methane? If so, is it bio- genic or abiogenic?

NUCLEAR BOMBS WILL NOT SAVE THE EARTH!

Not too long ago, geologists adamantly denied that there were any large meteor craters pockmarking our planet. Now, they find 100-kilometer craters on a regular basis. And scientists are eas- ting worried looks at those near-earth asteroids, knowing that one day one will be on a collision course.

Not to worry, say the modern-day Technocrats, we will launch nuclear- armed rockets that will nudge such cosmic threats into harmless trajectories.

These Pollyannas are presumptuous. They assume that asteroids are hard, cohesivo objects that will be shoved aside by a few megatons of explosive energy. There are two things wrong with this idea, and these reveal how radieally our ideas about the nature of asteroids have changed in just 10 years.

First, most astronomers will now agree that asteroids are orbiting rubble piles rather than monolithic objects. For example, the near-earth asteroid Mathilde, 53 kilometers in diameter, has a density of only 1.3 grams/cubic centi- meter. Its porosity must be greater than 50%. It is not a hard, coherent object. Instead of a buUet, it is more like a cloud of shotgun pellets. It would be hard to divert all this debrls with a nuclear blast.

. "ake matters worse, asteroids like Mathilde are stickier than a cloud buckshot. This fact is deduced from photos of asteroids showing many to be marked by huge craters. (MathÜde has one 33 kilometers wide.) K.R. Housen et al, using laboratory tests and scaling data, argüe that asteroid craters were not blasted out by collision. (Mathilde is not "shattered" as one would expect given such a huge cráter.) Rather, the craters are "dents" instead of holes! Cosmic rubble piles are like sponges. Collisions with other rubble piles result in compression of the target surface and accretion of the smaller object. In effect, asteroids are energy absorbere and will hardly be fazed by a nuclear detonation.

(Asphaug, Erik; "Survival of the Weakest," Nature, 402:127, 1999.)

Comment ■ We are doomed- but not right away.

Many asteroids may be likened to plum puddings----just debris loosely bound by mutual gravitational forcé.

ASTEROID PONDS, BEACHES, AND BOULDERS

Once considered only dull, nondescript vagabonds of the solar system, asteroids are turning out to be rather mysterious and surprisingly complex bits of celestial real estáte. The close-up photos of the asteroid Eros (35-kilometers long) from the spacecraft NEAR-Shoemaker have added two new phenomena to the list of asteroid enigmas.

Boulders. Eros is covered with huge boulders —perhaps a million of them over 8-meters wide. The boulders are likely just accreted solar-system debris; but why are they strewn naked on the surface of Eros instead of being inter- mixed with other rocky debris? Specula- tion is that the large boulders were coaxed to the surface preferentially over the eons by seismic vibrations------said vibrations being caused by multitudinous impacts. This type of jostling action also explains why Brazil nuts greet you when you open a well-travelled can of mixed nutsl

Ponds and -beaches. The fine debris coating Eros may also have responded to the same vibrations, but in different ways. It sort of "flowed" downhül to form curious fíat features resembling ponds. Between the ponds and rough terrain, the fine debris has also built up transition zones that look like beaches.

Cornell's J. Veverka isn't betting on any of the proposed theories as yet. He declared:

> We're facing processes we're not familiar with. I truly don't know what's going on.

(Kerr, Richard A.; "Strange Doings on a NEAR-Struck Asteroid," Science, 291: 1467, 2001) ----------

Comment. It is Ínteresting to observe how vibrations may emulate the action of water in creating sandy topography. As a terrestrial case in point, the famed Mima Mounds in Washington state may have been created not by flowing water or pocket gophers but by earthquake vibrations. (See pp. 182 amd 183.)

COMETS

COMETS, ASTEROIDS, OR NEITHER?

Like supernova 1987A, also mentioned nearby, comet P/Shoemaker-Levi-9 is generating headlines in the scientiíic and popular media. Everyone expected that the impact of this comet on Júpiter would provide us with some very inter- esting phenomena, but raost thought that the debris kicked up by the impacts would reveal something new about Júpiter not about comets, since everyone
knows what they are! Instead, the long- held theory that comets are simply dirty iceballs is now questioned. Shoe- maker-Levi-9 was originally classified as a comet because: (1). Its' fragments all appeared to be surrounded by comas like all well-behaved comets; and (2)
It was easily torn apart by Jupiter's strong gravitational field as it narrowly mis sed Júpiter in 1992. This is just what one would expeet from a loosely com- pacted dirty ieeball.

But doubts about Shoemaker-Levi-9's true nature have arisen because of two observations: (1) No water vapor has been detected in the plumes thrown up by the impacts of the fragments; and (2) The comet's Eragment M, which was supposed to have vaporized in 1993, as comets are wont to do, apparently did not and left a scar on Júpiter like the other fragments. So, Shoemaker-Levi-9 had no discernible ice (unlike comets; it was fragüe and easüy fragmented (unlike rocky asteroids); and Fragment M did not have a coma (unlike comets but like asteroids)! Was Shoemaker-Levi- 9 really a comet?

(Roylance, Frank D.; "Is That Really a 'Comet[1] Hitting Júpiter?" Baltimore Sun, July 20, 1994. Roylance, Frank D.; "Fragment M's Reappearance Puzzles Astronomers," Baltimore Sun, July 22, 1994)

Reference. See our catalog The Sun and Solar System Debris for more on the comet-asteroid question.

ARE THE COSMIC CARRIERS OF LIFE COMETS OR METEORITES?

Forget that warm little pond and even the hotter deép-sea vents as potential incubators of life. Today's scientists are looking more and more to the cosmos as the supplier of life's Chemical seeds and possibly even completed life forms; say, extremophile bacteria! Some astronomers hold that comets are the life- carriers; others prefer meteorites. We see this dichotomy of learned opinión in the following quotations.

> Most of the biosphere was brought on the primitive Earth by an intense bom- bardment of comets. This included the atmosphere, the seawater and those volatüe carbón compounds needed for the emergence of life... This cometary origin may have far- reaching cosmological consequences, in particular for the origin of life in other planetary systems.

(Delsemme, Armand H.; "Cometary Origin of the Biosphere," Icarus, 146:313, 2000)

> In summary, meteorites provide an opportunity to evalúate space re- sourees experimentally, as resources for human settlement and the expansión of life. We have applied soü fertility, microbial and plant culture tests to various meteorites and found that they can support microorganisms and plant growth. The interiora of meteorites would have been suitable to origínate life, and the biológica! results suggest that they could also support early life forms
>
> The measured nutrients in meteor- ite samples allow calculating the bio- mass that the Solar System can support. Such calculations show that the asteroid materials alone can support trillions of humans in comfort in this Solar System alone. Settling the Solar System alone can therefore assure our survival and aüow virtually unlimited human expansión and development.

(Mautner, MichaelN.; "Meteorites, and the Origins and Fu ture of Life," Meteorite, 8:8, February 2002)

DO SOME COMETS JUST GO "POOF' ?

The great reservoir of Solar System comets is believed to hover far beyond Pluto in the hypothetical Oort Cloud. While the distance to the Oort Cloud is something like 1,000 A.U. (ABtronomical Units; 1 A.U. = the earth's distance from the sun.), a much closer source of comets has been recently officially recog- nized. It is the Kuiper Belt of objects that circles the sun between 30 and 60 A.U. Apparently, the comets originating in the Kuiper Belt differ profoundly from those that are flung sunward from the faraway and unseen Oort Cloud by some presumed gravitational disturbance.

As the Kuiper Belt comets veer toward the sun, they produce the typical cometary comas and fiery tails. But when their volatües have been consumed, they turn into coid, dark asteroids. In con- trast, the Oort Cloud comets produce the same flashy visual effects but then they just seem to disappear—poof!

This conclusión is consistent with the fact that each year about a dozen Oort Cloud comets penétrate the inner Solar System. At this rate of influx, there should be 100 times more burnt- out Oort Cloud cometary cadavers than the astronomers can find with their tele- scopes. The best guess is that they just disintegrate into space dust. The impli- cation is that Oort Cloud and Kuiper Belt comets are structurally different and probably have different origins.

Yet, a few Oort Cloud comets, such as Halley's, do survive at least several trips into the realm of the sun without going mis sin g.

(Baüey, Mark E.; "Where Have All the Comets Gone?" Science, 296:2151, 2002. Tytell, David; "The Case of the Missing Dead Comets," Sky & Telescope, 104:20, October 2002.)

Comments. The Oort Cloud hypothesis has its detractors. (vol. 1, p. 80) And where did the Kuiper Belt "Objects" (KBOs) come from? Is Pluto one of them and, therefore, must be dethroned as a planet? The latest Kuiper Belt Object, bearing the tongue-challenging ñame Quaoar, is 800 miles in diameter, larger even than Ceres, the largest asteroid at about 600 mües in diameter.

STARS

THE SUN

As the closest star, our sun ¡s one key to understanding some of the other denizens of the cosmos.. Our increasingly rich store of knowledge about the sun has led to many anomalies and curious phenomena worthy of inclusión in our catalogs and compilations. During the period 1994— 2004, seven such have made the cut for this book.

•Anomalous Solar Eclipses. Unusual coronas, radio-reception anomalies.

•Solar Neutrino Problem Solved————at a Price. The paucity of solar neutrinos can be explained by upsetting the Standard Theory of sub- atomic physics.

•Elusive Magnetic Pole. Where is the sun's south magnetic pole? Is a solar magnetic reversal underway?

•When the Solar Wind Ceased. A remarkable doldrum.

•Solar Superflares. These could wipe out humanity!

•Sunspots and Planetary Positions. More on the oíd idea that the positions of the giant planets somehow stir up sunspots.

•Cosmic Voyeurism. An amusing potential effect of General Relativity.

ANOMALOUS SOLAR ECLIPSES

CURIOUS CORONAS

Down the years, many remarkable solar coronas have been sketched during the few minutes of totality. Long coronal petáis and errant streamers, often asymmetrically arrayed, are common in the Nineteenth Century astromony journals. Scientists have no problems with the distorted apparitions. It is the highly geometrical coronas that are hard-to-aecount-for. The reported colored coronas, too, seem unlikely.
Red, blue, and green hues are definite- ly frowned upon. Coronas should be brilliant white, perhaps yellowish.

S.J. O'Meara, a contributing editor of S&T, thinks many of the oidor and wilder drawings of coronaB can be pin- ned on observer enthusiasm and active imagination. Modera photographs of coronas provide a much more conserva- tive picture of the eclipsed sun. Aв for all those oíd observations of color ed coronas, aerosols in the atmosphere, perhaps of volcanic origin, could have added the delicate tints reported. Ob ■ viously, no anomalous phenomena were involved. Book elosed, problem 3olved!

(O'Meara, Stephen James; "S.trange Eclipses," Sky & Telescope, 98:116, August 1999)

E. *L. Trouvelot's portrait of the total solar eclipse of July 29, 1878, as seen from Wyoming. Note the unusual geo- metrical symmetry of the spectacular corona.*

IT'S ALL IN THE BELIEVING

Returning to the subject of solar eclipses, it seems that in the past eclipse phenomena have been employed to promote an appealing theory even when the observations were of poor quality. Scientists have been known to "spin" data like politicians!

A classic case of scientifie "spin" occurred in connection with the total solar eclipse of 1919. British astronomer A. Eddington had mounted expeditions to Sobral, Brazil, and the island of Principe off the west coast of Africa.
He had telescopes set up at these two locations to measure the bending of starligbt by the sun, as predicted by Einstein's Theory of Relativity. In 1919, Relativity was not yet the corner- stone in the Temple of Science that it is today. Eddington "believed" in Relativity and wished to make it more acceptable. Eclipse photos showing the shifting of star images by the gravita- tional influence of the eclipsed sun iright do the job.

On the day of the eclipse, Principe was bedeviled by clouds, and only 2 photographic plates were deemed mar- ginly acceptable. At Sobral, 18 poor plates and 8 better plates were obtained. The problem was that the 18 poor plates yielded a deflection of starlight much smaller than predicted by Relativity, while the 8 better plates pro- duced a much higher valué. By adding the 2 plates from Principe to the mix, Eddington managed to come up with a number cióse to that required by the Theory of Relativity. It was not the clear-cut victory for Einstéin that the textbooks proclaim.

Yet the spin was on! The New York Times trumpeted: * 11

Lights Askew in the Heavens. Men of Science More or Less Agog; Einstein's Theory Triumphs.

Everywhere scientists began to take Relativity more seriously; Einstein's ■ star rose rapidly. Of eourse, it all turned out well in the end, because we now have many other, more convincing data supporting Relativity. But this happy ending does not subtract from the fact that Eddington let ideology affect his conclusión. Even today, the results from the 1919 eclipse are still proclaimed to be proof of Relativity.

(Morton, Oliver; "Science in the Dark," Wall Street Journal, August 11, 1999.
Cr. E. Fegert)

A Y AGI WAT CHES A SOLAR ECLIPSE

During the partial solar eclipse of July

11, 1991, D. Emerson had his Yagi antenna pointed in the direction of the phenomenon. His receiver was tuned to 145.8 MHz. The sun is always emitting radio noise, and one would expect that the moon passmg in front of the sun would gradually cut off most, but not all, of the radio noise picked up by the antenna and, after the eclipse's mid-point, the noise would increase back to normal levels. Instead of the expected:

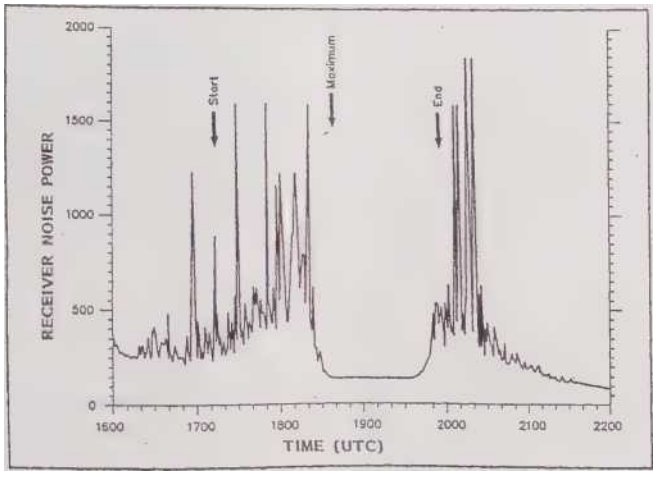
There was no radio evidence of any effect of the solar eclipse until 1822 UTC, 58 minutes after the start of the eclípse. At that ooint. nll de- tectable solar emission disappeared within the space of about nine minutes. The emission did not start to reappear until 72 minutes later, at 1943 UTC, and was fully restored by 1951 UTC, 13 minutes before the end

of the eclipse, which occurred at 2004 UTC.

The fací that radio emission disappeared and reappeared fairly abruptly parí way through the eclipse indicates that most of the radio emission was occurring from one discrete point on the snn's surface rather than from the entire solar disc.

(Emerson, Darrel; "Radio Observations of Two Solar Eclipses," QST, p. 21, February 1995. Cr. L.M. Nash)

Comment. What was happening at this small región of the sun's surface?



Radio-noise power measured during a partial solar eclipse. The arrows indícate the stages of the eclipse.

SOLAR NEUTRINO PROBLEM SOLVED----AT A PRICE

PERPLEXING SIGNALS FROM THE SUN

It is rather amazing that we can de- tect neutrinos at all. Carrying no elec- tric charge and possibly massless, most zip right through the entire earth as if it were not there. A very, very few, however, are captured in huge, fluid- filled tanks built by physicists. These trapped ghostly partióles tell tales we do not yet fathom.

We have mentioned the solar-neutrino problem before (vol. 1, p. 84 for ex- ample). It is one of science's more per- plexing and enduring mysteries. Even the most modern, sophisticated neutrino detectors eount only about one-third the number of neutrinos that the sun "shouid" be sending in our direetion-------- according to our best theories on the nuclear reactions simmering away in the solar core.

To this classical neutrino problem has been added the discovery that the solar neutrino flux varies in ways difficult.to explain. P. Sturrock and G. Walther, at Stanford University, scrutinized 20 years of data from a detector deep in the Homestead Mine in South Dakota and find that the neutrino flux seems to peale every 21.3 days, varying as much as 30% to 100%. It may be that the sun's fusión "engine," long thought to run steadily and smoothly, sputters in a cyclic fashion? If an automobile engine did this, we would take it to the garage!

(Holden, Constance; "More Neutrino Mystery," Science, 273-.1663, 1996)

The problem deepens: The fírst 102 days of neutrino data from Japau's new Super-Kamiokande detector suggest that the solar neutrino flux is greater at night than during the day, and that it also varies during the year.

(Anonymous; "First Data from New Neutrino Detector," Science News, 151:279, 1997)

Comment. However, see the next Ítem.

SOLAR MODEL CONFIRMED, BUT STANDARD MODEL CRIPPLED

A persistent astronomical anomaly (well-covered above and in vol. 1) has apparently been satisfactorily disposed of. Even staunch anomalists will have to cióse the book on the solar-neutrino- deficit problem. No déficit really exists because the neutrinos emitted by the sun change while in flight from a type that is easy to detect to a type that is diffi- cult to register expertaentally. The total number of neutrinos reaching the earth is what it shouid be according to theory but we have not been able to detect them all. This neutrino schizo- phrenia has now been confirmed, and our theory about how the sun works is safe.

But the erasure of the solar-neutrino-defleit problem tells the partióle physicists that neutrinos do indeed change type, which taplies that they possess mass. But anomalies are somettaes con- tagious. The Standard Model of partióle physies, so successful in many respeets, is now ailing. It asserts that neutrinos cannot change types and do not possess mass.

(Seife, Charles; "Polymorphous Partióles Solve Solar Mystery," Science, 292:2227, 2001. Weiss, P.; " Physies Bedrock Cracks, Sun Shines In," Science News, 159:388, 2001)

Comment. Without question, we have here an experimental triumph, but the undermining of that pillar of physies, the Standard Model, is a high price to pay. We have closed one book, but Nature has replaced it with another that is more fundamental and wide open.

ELUSIVE MAGNETIC POLE

ON THE SUN, SODTH IS ALMOST EVERYWHERE

Astronomers have been shocked by the discovery that the sun has no south pole!

Instruments on board the probe Ulysses have been measuring the radial component of the solar magnetic field. The fíeld lines were expected to become more bunched and intense as the probe approached the south pole. "Instead, the strength of the magnetic field remained absolutely constant," says Richard Marsden, a project scientist on Ulysses.

(Anonymous; "No Solar Pole," New Scientist, p. 11, September 24, 1994)

WHEN THE SOLAR WIND CEASED

INTERPLANETARY DOLDRUMS

A special session of the 1999 Fall Meeting of the American Geophysical Union was convened to discuss an extraordinary event: "The day of the solar wind almost disappeared." That was May 11, 1999. The doldrums lasted over 27 hours. Actually, the velocities of the particles constituting the solar wind did not slacken much: 360 kilometers/second, down just 10% from the norm. The wind's density, though dropped from 10 to 0.2 particles/.cubic centimeter. Nothing un- toward happened on the earth's surface. In space, the earth's magnetosphere expanded when the pressure of the solar wind diminished and more X-rays were emitted from the polar atmosphere, but these effeets did not surprise anyone.

The big question is: What happened on the sun that stopped its exhalations? No one seems to have an answer.

(Lazarus, Alan J.; "The Day the Solar Wind Almost Disappeared," Science, 287: 2172, 2000)

SOLAR SUPERFLARES

OÜR LUCKY STAR

About every 5 years our sun spits a glant blob of ionized gases in the earth's rtireetion. These "coronal mass ejections" or fiares inferiere with terrestrial com- nranieations and knock out power grids. But we are lucky it isn't worse.

Studies of stars in our galaxy similar to the sun find that they emit super- flares about once every century. If our sun sent such a super-flare our way, the atmosphere would glow like a neón tube, our fleet of satellites would be fried, and half the protective ozone layer would disappear in a flash. Earth Ufe would survive—at least for a while.

Our sun, it seems, is favored with anomalous stabiUty, but no one knows why. We are siraply lucky!

(Seife, Charles; "Thank Our Lucky Star," New Scientist, p. 15, January 9, 1999)

Comment. We also Uve in a "lucky" galaxy. (See p. 316) One might easily beUeve that the universe is anthropic; i.e., favoring humans; at all astronomi- cal and biological levels!

SUNSPOTS AND PLANETARY POSITIONS

SUNSPOTS AND PLANETARY ALIGNMENTS

Many scientists and laymen have noticed that the sunspot cyele and Jupiter's period are both about 11 years. This must be a coincidence, because the tidal forces exerted on the sun by distant Júpiter seem far too weak to disturb the sun's internal operations. (See details in our catalog The Sun and Solar System Debris.)

Could it be that we are missing something, for there is some evidenee that some planetary alignments also exert influence on the number of spots seen on the sun's face?

In particular, the Uranus-Neptune- earth conjunction has been investigated by B. Payne, who wrote the foUowing in Oyeles:

> **Sunspots increase when two or more planets Une up, an effect I have observed for more than a decade. During the last six years, Uranus and Neptune have been within a few degrees of each other. Their con- junction, which occurs every 137 years, is an ideal situation to vali- date the hypothesis that sunspot num- bers are associated with planetary positions.**

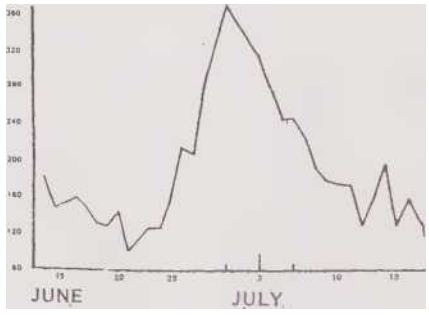
Payne's lengthy analysis is omitted, but the essence of his study can be seen in the accompanying graph. He concludes:

> **The results clearly show that sunspot numbers inerease markedly during Uranus-Neptune-Earth-sun aügnments.**

(Payne, Buryl; "Sunspot Number Changes during Planetary AUgnments," Cycles, 45:146, 1995)

Comments. It wiU take a lot more than one such conjunction to convinee the scientific community that the mere Uning up of comparatively tiny planets can have any effect on those huge storms we cali sunspots!

Cycles has been a pubücation on the fringe of Science for many years.



***Sunspot numbers during the 1990 con- junction of earth-Uranus (June 30) and earth-Neptune (July 6)* .**

COSMOLOGICA!» VOYEURISM

COSMOLOGICAL VOYEURISM?

It is not uncommon, given a sky popu- lated with tiny ice crystals, to see one or more "Bun dogs" (parheUa) athwart the true sun. These false suns are created when sunlight is refracted by the ice crystals.

It is also theoreticaUy possible to see an image of the sun in the middle of the night sky! Instead of being refracted by ice crystals, this postulated nighttime sun would be imaged the powerful gravi- tational field of a black hole lurking nearby. The outgoing sunUght would be bent 180° as it passed around the black hole. This would be an extreme case of gravitational lensing----a well-recognized, frequently observed astronomical pheno- menon.

> **A black hole near the solar system would produce a very dim image of the sun in the night sky. The image, which would uppear for several hours and recur once a year, might be picked up by ongoing searches for gravitational microlensing.**

(Musser, George; "Doing a 180," Scien- tific American, 287:36, November 2002.)

Comments. If the black-hole reflector is 1,000 light years away, we would see the sun as it appeared 2,000 years ago.
Given great progresa in instrumentation and Computer image-processing, we could' follow the sun's past history by obser- ving its reflections from black holes at varying distances from earth!

Of course, we must not stop here. The earth also shines and could be imaged in the same way-----though more dimly of course. Coneeivably, we could observe the past history of the earth, perhaps even record snapshots of bio- logical evolution in progress! Students: how could this image of the earth be seen with the sun in the way?

SUPERNOVAS

A CRACK IN THE FOUNDATIONS OF MAINSTREAM ASTRONOMY

In 1999. an issue of the Meta Research Bulletin digested ten recent unsettling astronomical discoveries. From these, we select one involving supernovae for your delectation.

> **Distant supernovae have a rise time of 10-15 percent faster than nearby type supernovae. This throws doubt on their use as standard can- dles, and on the interpretation that the expansión of the universe is ac- celerating. Interestingly, the amount of the discrepancy is cióse to the size of the special relativity time dilation factor, gamma. If the cause of the red shift were something other than velocity, then no time dilation factor would be applicable, and this dis- crepancy would disappear.**

(Van Flandern, Tom; "Highlights of the Latest EME," Meta Research Bulletin, 8:64, no. 4, 1999)

"AN UNPRECEDENTED AND BIZARRE OBJECT"

So said C. Burrows, codiscóverer of this new cosmic conundrum. The instiga- tor of all the astronomical head scratch- ing is our oíd friend Supernova 1987A, the subject of several past SF ítems.
This time, the anomalies are associated with three bright rings now gracing 1987A's environs. The thin, dense, ellip- tical inner ring, the first to be noted, has always been a puzzle. Its diameter suggests that it was probably created about 30,000 years before 1987A blew up. But what is it? Its existence is hard to explain, as N. Panagia has confirmed:

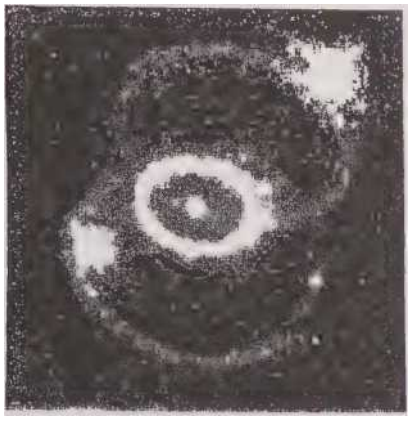
> **The presence of a dense, thin, ring surrounding a massive star at the end of its evolution is not easy to account for.**

In other words, this ring is foreign to mainstream astronomical theory.

Now, with the help of the Hubble Space Telescope, two additional faint rings near 1987A have been detected.
One seems to be the mirror image of the other. The bizarre part is that they are not centered on 1987A at all, like the ring mentioned above. One of the new rings seems to be in front of 1987A, the other in back—but this is a sub- jective cali. Speculation is rampant, and

all three rings are enigmatie, Is 1987A blowing out rings of matter front and back?

(Panagia, Niño; "Origins Revealed in Demise," Nature, 369:354, 1994. Cowen, R.; "Mysterious Rings Surround Super- nova," Science News, 145:340, 1994)



The three rings surrounding supernova 1987A as of 1994.

EXTRASOLAR PLANETS

ARE THERE NO OTHER EARTHS ODT THERE?

The expeetation of science-in-general has always been that circling the biUions upon bUions of stars are at least miliions upon miUions of planets. And, of course, some of these multitudinous planets will be warm, wet, and pregnant with life.

WeU, there are other planets out there. Over 100 have been discovered so far, but none looks anything like the earth or even Mars or Venus. At least not yet!

> Extrasplar planets have peculiar properties, and our understanding of how planets form, which was incomplete even before the new data became avail- able, now looks even shakier. The newly discovered bodies have strange, highly elliptical orbits. They are also far closer to their stars than equiva- lent planets in our Solar System. Amid the thrill of diseovery, planetary sci- entists are wondering how to make sense of the processes that shaped these strange new worlds.

These "strange new worlds" are about the size of Júpiter; and life as-we-know- it could hardly arise on Jupiters.

(Falk, Dan; "Worlds Apart," Nature, 422: 659, 2003)

Comments. Perhaps it is earth that is "peculiar," and our solar system, too. Maybe it is really peculiar that earth and our neighboring planets mostly ply such nicely circular orbits with low inelinations to the plañe of the ecliptic. Even more peculiar in our solar system is the 1/180 split in angular momentum between the sun and all the planets and debris that orbit around it. One would expect the massive sun to have most of the solar system's angular momentum.

If the typical extrasolar planet is truly Jupiter-like and plies an eccentric orbit cióse to its sun, what sorts of con- catenations of moleeules might have formed and evolved in such alien environments? Given the earth's incredible biodiversity (possibly 100 million species), we should not underestimate nature's inventiveness on worlds that seem inimical to our forms of life.

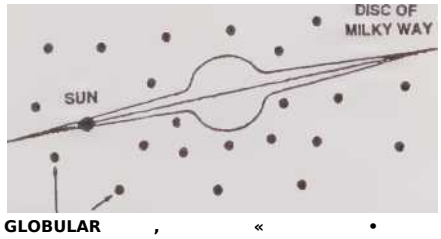
MISSING PLANETS IN GLOBULAR CLUSTERS

If you lived on a planet circling a star in a globular cluster, you would see a night sky ablaze with thousands of stars all brighter than the brightest in the earth's sky. This is because globular clusters contain tens of thousands of stars all compressed into 5-25 parsecs— they are mueh more tightly packed than those in the Milky Way in general.

In fact, though, you would have to observe this blazing sky from a space- ship, because diligent searches have not detected any planets in any of the many globular clusters. In 1999, a team of 24 astronomers used the Hubble Space Tele- scope to search for planets in the cluster named 47 Tucanae. Their method was to look for dark planets Crossing the bright disks of the cluster's stars. After patiently watching 34,000 stars, they carne up empty-handed. For some unknown reason, planets never formed around the stars in 47 Tucanae—or in any other globular clusters checked so far. Áre globular clusters in general different from the rest of the Milky Way? Possibly, see below.

(Anonymous; "No Globular Planets?" Ástronomy, 28:34, October 2000. Anony- mous; "Planets Come Up Missing in a Globular Cluster," Sky & Telescope, 104:23, October 2000)

Answer. Globular clusters are peculiar in several additional ways. For example, the globular clusters in the Milky Way have a spherical distribution rather than being compressed inʃo a fíat spiral with the rest of our galaxy's stars. There is even evidence that the clusters may not particípate in the Milky Way's ponderous rotation. See our catalog Stars, GalaxieB, Cosmos for still more globular-cluster idiosyncracies.



GLOBULAR , « •
CLUSTERS

Globular clusters are dense aggregations of tens of thousands of stars. These clusters pervade the disc-shaped Milky Way but seem independent of it in some ways. By way of contrast, the stars in globular clusters do not seem to have any planets circling them.

STELLAR MISCELLANY

EINSTEIN'S NEMESIS: DI HERCULIS

DI Herculis ıв an 8th.-magnitude eclip- sing binary about 2,000 light years from earth. These two young blue stars are very cióse----only one fifth the distance from earth to our sun. They orbit about a common center of gravity every 10.55 days. So far, no problem!

. The puzzle is that, as the two stars swing around one another, the axis of their orbit rotates or precesses too slowly. General relativity predicts a precession of 4.27°/century, but for DI Herculis the rate is only 1.05°/century. This does not sound like a figure large enough to get excited about, but it deeply troubles astronomers. D. Popper, an astronomer at UCLA, says:

> The observations are pretty olear. I don't think there's any question there's a discrepancy and, frankly, it is an important one and it's unre- solved.

Accentuating the challenge to general relativity is the diseovery that a second eclipsing binary, AC Camelopardalis, also violates general relativity in the same way. It seems that wherever gravi- tational fields are extremely strong and space-time, therefore, highly distorted, general relativity fails.

Ironically, it was a very similar sort of astronomical observation that helped make general relativity a pillar of the scientific edifice early in the 20th. cen- tury. The orbit of Mercury precesses a bit fáster than Newtonian physics predicts. The appiication of Einstein's general relativity corrected the calculation of Mercury's rate of precession by just the right amount. Now we may need a new theory to correct Einstein—at least where time-space is sharply bent!

(Naeye, Robert; "Was Einstein Wrong?" Astronomy, 23:54, November 1995)

EINSTEIN QUESTIONED

First, we need a definition:

Aberration: The apparent angular dis- placement of the position of a celestial body in the direction of motion of the observer, caused by the combination of the velocity of the observer and the velocity of light.

(McGraw-Hill Dictionary of Scientific and Technical Terms)

Next, some historical background:

An Abstract. Stellar aberration, dis- covered nearly three centuries ago by Bradley, was immediately recognized as a phenomenon owing to the velocity of the earth in its orbit around the sun. Einstein provided an explanation of aberration in his famous 1905 paper using his new relativity theory, and his explanation remains essentially without modiflcation in many modern textbooks. Herein, we show that his explanation is very mueh in disagreement with measure- ment.

(Hayden, Howard C.; paper to be pub- lished in Galilean Eleetrodynamics, vol. 4, no. 5, 1993)

Lastly, pinpointing an anomaly:

A Comment. The essenee of Prof. Hay- den's main argument is that, if stellar aberration depended on the relative velocity between source and observer (as Einstein maintained), then each compo- nent of a spectroscopic binary star would have drastically different stellar aberration, contrary to observation.

(Van Flandern, Tom; Meta Research Bulle tin, 2:29, 1993)

THE 21-MICRON MYSTERY

The following phenomenon is rather tech- nical and is observable only to those astronomers lucky enough to have an infrared spectrometer aboard a satellite. These privileged seientists "see" strange infrared shrouds centered at 21 microns draped around certain red' giant stars.
The feature of these infrared shrouds that makes the phenomenon worthy of our attention in Science Frontiers is the width of the spectrum. It is so wide that it can- not be produced by single atoms or mole- cules. The shrouds must consist of com- plex molecules, possibly even solids. The infrared glows are so strong that the elements involved must be common in the universe, in all likelihood carbón and hydrogen. Speculators have fingered polymers, ball-shaped fullerenes, and "nanodiamonds"; i.e., very tiny diamonds! The debate has seientists repairing to their laboratories where they are trying to find some substance with a spectrum that matches that of the mystery shrouds.

(Hellemans, Alexander; "Labs Hold the Key to the 21-Micron Mystery," Science, 284:1113, 1999)

Comment. Are not biological materials rich in carbón and hydrogen? This re- minds us of F. Hoyle's books: Lifecloud and Diseases from Space, wherein outer space is characterized as teeming with prebiotic molecules, bacteria, and even- more-bizarre life forms.

STRANGE AND STRANGER ASTRONOMY

The list of .exotic astronomical objeets grows apace. In this issue of SF we record two strange objeets that we can see but do not understand, a kind of particle that has been predicted but which is not to be found in ordinary
matter, and, fourthly------once again— that elusive stuff called "dark matter" that we cannot see and whose properties we cannot even predict.

RXJ1856. This tiny star is only 5-6 kilo- meters in diameter and much too small to be a neutrón star. It is now believed (by some, at least) that RXJ1856 is com- posed of degenerate matter so dense that even subatomic partióles, such as neutrons and protons, have collapsed, leaving only their internal componente, the "quarks," to constitute this aptly named "quark star" or "strange star."
Quarks are hypothesized to be the sub- subatomic partióles that make up such subatomic partióles as neutrons, protons, etc. There are several quark species with fanciful ñames. Usually, they are tightly confined inside the neutrons and protons, but in Object RXJ1856 they naked and packed together like sardines. It remains to be seen just how "strange" quark stars are.

Strange Quarks. Amidst all the "normal" quarks in strange star RXJ1856, theorists suspect that "strange quarks" must also be rubbing shoulders with their normal brethren. Strange quarks are theorized to be heavier than normal quarks and absent from normal matter.
It's getting hard to sepárate normal matter from strange matter, and strange matter from that doubly strange matter containing strange quarks!

3C58. Like RXJ1856, 3C58 is composed of strange (there's that word again) forms of matter. This time the strange stuff consists of crystals of pions or kaons, which are types of subatomic partióles called "mesons." Mesón crystals have been glimpsed fleetingly in high-energy accelerator experiments. But one has to wonder what strange forces induce them to aggregate in crystalline forms.

(Seife, Charles; "If It Quarks Like a Star, It Must Be... Strange?" Science, 296:238, 2002. Weiss, P.; "Strañgi Stars," Science News, 161:246, 2002.)

HOW CAN SOME STARS BE OLDER THAN THE UNIVERSE ITSELF?

The answer is, of course, if the astronomers' docks keep bad time. On one hand, stellar age theory assures us that stars in the globular clusters that pervade the universe were born about 15 billion years ago. On the other hand, new measurements of the distanee to the Virgo cluster of galaxies are equally adamant that these objeets are much
closer than thought-----so cióse that, assuming the standard Big Bang model and the resultant expanding universe, the age of the universe may be as small as 8 billion years! In other words, the universe is younger than some of the stars in it; an obvious and painful dilemma for astronomy.
How will this conflict between the two dominant astronomical paradigms play out? Many are betting that the Big Bang theory will require a major over- haul.

(Jacoby, George H.; "The Universe in Crisis," Nature, 371:741, 1994. Travis, John; "Hubble War Moves to High Ground," Science, 266:539, 1994)

Comments. A clever resolution of the above age problem would be for the ancient globular duster stars to be left- overs or interlopers from an older universe. The globular clusters are anoma- lous in several other ways. See our catalog Stars, Galaxies, Cosmos.
More recently, the age diserepaney described above has apparently been resolved with general agreement that the universe is about 14 billion years oíd.

COSMOLOGY

GALAXIES, QUASARS, BLACK HOLES

GALAXIES

SUBJECT CLOSED: THERE ARE NO OTHER GALAXIES ODT THERE!

> The question whether nebulae are extemal galaxies hardly any longer needs discussion. It has been an- swered by the progrese of research.
> No competent thinker, with the whole of the available evidence before him, can now, it is safe to say, maintain any single nébula to be a star system of co-ordinate rank with the Milky Way. A practical certainty has been attained that the entire contents, stellar and nébula, of the sphere be- long to one mighty aggregation, and stand in ordered mutual relations within the limits of one all-embracing scheme.

The above was written by A. Clerke in her well-respected, popular book The System of the Stars. Its sense of finality would make any budding astronomer pause before looking for extra-galactie objects. It would have been a waste of time to try. No committee would allot him or her telescope time for such a sure-to-be-fruitless search. The time frame here (perhaps you guessed already) was 1905.

Now, almost a century later, that void beyond the Milky Way teems with untold billions of other galaxies, not to mention quasars, black holes, dark matter, and who really knows what else?

F. Hoyle et al used this incontestable, there-is-nothing-else-out-there paradigm in the introduction to their recent book A Different Approach to Cosmology, 2000. The bulk of this book is highly unfavor- able to the Big Bang, but we have be- labored that paradigm enough and turn instead to Chapter 28. "Some Unsolved Problema." Three of these cateh our eye:

- The origin of the angular momentum of astronomical bodies
- The origin of magnetic ñelds in galaxies and intergalactic space
- The peculiarities in the redshift distribution (i.e.; quantization)

These telegraphic section titles con- ceal some very deep mysteries, which we shall return to in future issues.

Comment. The observant reader will note that none of these three mysteries is included in the list of eight major astronomical conundrums published in Astro- nomy in June 2001.

WRONG-WAY STARS IN SPIRAL GALAXIES

Spiral galaxies are believed to form when gigantic clouds of gas collapse under the pulí of gravity to create spinning dises. Further condensations give rise to the billions of stars that make up these im- mense rotating stellar wheels. Intuitively, one would expect all of the stars in a given galaxy to rotate around the hub in the same direction, like all of the water molecules in a Whirlpool. But galaxy NGC4138, 50-million light years away, deñes this common-sense expecta- tion.

M. Haynes and colleagues at Cornell have discovered that fully one-fifth of this galaxy's stars are rotating in a direction opposite from the rest. Other- wise, NGC4138 is a well-behaved spiral galaxy, almost a boring one, exhibiting no signs of internal turmoil or past col- lisions with another galaxy. However, all of the wrong-way stars appear to be . youngish. This little clue may lead to some sort of explanation.

(Muir, Hazel; "Counter-Revolutionaries Lurk in Spiral Galaxies," New Scientist, p. 18, March 16, 1996)

Comment. If all of NGC4138's counter-rotating stars did condense from the original spinning gas disc, their large wrong-sign angular momentum would have had to be compensated for by a speed up of all the "right-way" stars.

MORE WRONG-WAY STARS

When we marvel at the photographs of billion-star spiral galaxies majestically rotating in the void, it is hard to be- lieve that some of their stars might be going against the ponderous Whirlpool motion. Yet, such counter-rotating stars do exist, and sometimes there are a lot of them.

Above, we reported that a few wrong-way stars swirled against the current in spiral galaxy NGC4138. Now, we fínd that in NGC4550 fully half of its stars counter-rotate. In NGC7217, one third of its stars are retrograde.
In 28 dass SO galaxies that have been examined, 24 ± 8% of the gas dises counter-rotate with respect to the stars.

The prevailing explanation for these muddled galaxies is that "right-way" galaxies merged with "wrong-way" galaxies, and we are viewing cosmic hybrids.

(Kuijken, Konrad, et al; "A Search for Counter-Rotating Stars in SO Galaxies," Royal Astronomical Society, Monthly Notices, 283:543, 1996)

AN OLD GALAXY IN A YODNG PART OF THE UNIVERSE

As the Hubble Space Telscope has probed ever farther toward the supposed edge of the universe, it has discerned, as expected, many youthful-looking galaxies. Since such deep-viewing tele- scopes are thought to be looking far back into time as well as space, youthful galaxies are not only expected but de- manded by the Big-Bang/expanding uni-verse theory. Unfortunately for theory, these telescopes have also identiñed a handful of apparently very oíd galaxies cavorting amidst the youthful ones!

> The problem, if qonventional cosmo-logical models are correct, is that galaxies that oíd and that far away simply should not be there. The ob-servation tightens the thumbscrews on the Einstein-de Sitter cosmological model, and offers evidence that at least some galaxies formed at very early epochs, within a billion years after the Big Bang.

(Kennicutt, Robert C., Jr.; "An Oíd Galaxy in a Young Universe," Nature, 381:555, 1996)

Comment. A similar age discrepancy has been claimed for some galaxies that Beem to harbor stars older than the universe itself! (p. 84)

WHERE'S THE FUZZ?

Every maker of astronomical telescopes aims to produce really sharp images of the stars and galaxies. This is exactly what the Hubble Space Telescope does. The farthest galaxies are sharp and olear.

But cosmologists are aghast when they examine these fuzzless images of distant galaxies. According to their quantum-mechanical concept of space-time, these galaxies at the far edge of the universe should be blurry.

Cosmologists—most of them, any way — believe that the texture of space-time is foamy. This must be because space, time, light, and just about every physical dimensión are quantized.. Nature is not smooth! As light plows through billions of light-years of quantized space-time foam, the images it produces in our telescopes should be a bit blurry. The crispness of the Hubble Space Telescope pictures there- fore suggests that something is wrong with the conventional cosmological model with its foamy structure. Included among these doubts are the Big Bang and General Relativity. '

(Britt, Robert Roy; "Hubble Pictures Too Crisp," SPACE.com, May 9, 2003. Cr. D, Swaner)

GHOST GALAXIES

Small ghost galaxies, devoid of stars but harboring dense elumps of invisible matter, may outnumber the entire population of lurninous galaxies in the universe.

If ghost galaxies contain no stars at all, how do we know they are there? By extrapolation! In recent years, astrono- mers have been áble to deteet dwarf galaxies lit by just a few lurninous stars. These faint, miniscule galaxies are kept from flying apart by the gravitational pulí of invisible dark matter. In fact, the density of dark matter in dwarf galaxies is a hundred times that in our bright, normal-size Milky Way. Further, the more dwarfish and dimmer a galaxy, the denser its dark matter and the more of them there are in the universe. Now for the promised extrapolation.

J. Kormendy and K.C. Freeman take things one step further, coneluding that the universe is flooded with sub-dwarf galaxies that are thick with dark matter, and without enough lurninous stars for us to see them in our teleseopes. These ghost galaxies are only 1/10,000 as mas- sive as the bright galaxies like the Milky Way but mueh more eommon.

(Cowen, R.; "Tiny Galaxies Have Hearts of Darkness," Science News, 155:38, 1999)

Comments ■ If the universe is awash in ghost galaxies, why don't wé bump into them occasionally? Maybe we have!

Another thought: Could these ubi- quitous ghost galaxies be spinning coun- ter to the bright galaxies thereby yield- ing a universe with zero angular momen- tum?

QUASARS

2,000,000,000 BC: THE EPOCH OF QOASARS

Quasars are remarkable astronomical ob- jects. Discovered only 30 years ago, they are the most lurninous entities in the universe. Supposedly poweréd by a black hole, each quasar emits hundreds of times more energy than all the billions of stars in the Milky Way. Just how a quasar works is surmise. What we now know from two surveys by two different groups of astronomers is that most quasars have redshifts between 2 and 3.

In the theoretical framework of the ex- panding universe, redshifts are propor- tional to recessional velocity, distance from the observer, and age. From the redshifts, it seems that the quasar epoch spanned the period 1.9-3.0 billion years, based on an age of 15 billion years for the universe. Assuming the accuracy of this scenario, cosmologists now have to explain why quasars were born and flourished in such a narrow time slot.

Did something fundamental change in the universe between 1.9 and 3.0 billion years ago?

(Kaiser, Jocelyn; "Epoch of Quasars," Science, 269:637, 1995. Wilford, John Noble; "New Survey of Sky Finds Most Quasars are Equally Aneient," New York Times, August 8, 1995, Cr. J. Covey)

Comments. Anomalists cannot fail to re- mark that the above discussion hinges upon four concepta: black holes, an ex- panding universe, redshifts as measures of velocity, and the Big Bang. Each of these ideas is plagued by discordant observations. The "epoch of quasars" is, therefore, a fabric woven from contro- versial threads.

Two thoughts important enough to mention: (1) The idea of a quasar epoch is consistent with the quantization of red shifts mentioned by Tifft (vol. 1, p. 95); (2) Our personal speculation that a quasar epoch might involve a change in the fundamental properties of time, matter, and space-----something like a cosmic phase change (vol. 1, p. 329) Apparently, something was basieally different in the universe 1.9-3.0 billion years ago when quasars reigned. Curi- ously, there seems to have been something fundamentally different here on earth about 570 million years ago-----the time of the Cambrian explosión, when essentially all the basic body plans (the phyla) of life originated. (vol. 1, p. 187) If the universe is much younger than 15 billion years, as some astronomers insist, we might be able to correlate the two epochs when things were really different!

BLACK HOLES

FIRST YOU DON'T SEE IT; THEN YOU DON'T DON'T SEE IT

Astronomers are always claiming that they have observational proof that other stars have planets circling them and that black holes truly exist. These claims always fade away or are refuted. Recently, the papers were full of still another claim that a black hole had been found. This time there was no doubt; this was it; a bona fide, undeniable black hole. The search was finally over! ■ Later, though, this claim was muted to: "the best evidence yet for a black hole." [Remember that no light escapes a black hole; you cannot see it directly. It is detected only through its effects on nearby observable matter.]

Despite what the theorists fervently believe, black holes may not be lurking out there in space, unseen, but stül able to gobble up matter and unwary alien spacecraft. For exainple, consider the following iconoclastic tidbit:

> **A gigantic, exceptionally bright star that scientists thought could become a black hole is actually shedding mass at such an astonishing rate that it eventually will disappear, a díscovery that casts doubt on theories of steUar evolution, a researcher reports.**
>
> **"If such massive stars are losirig mass at such a prodigious rate, they will not form black holes but will peel off to virtuaUy nothing," Sally Heap, a NASA astronomer, said yesterday at a national meeting of the American Astronomical Society.**

.

In other words, the accepted means of black hole production------and, therefore, black holes themselveB-------still seem to be in observational limbo.

(Anonymous; "Discovery Questions 'Black Hole' Theory," Baltimore Sun, May 31, 1994)

Comment. Now, a decade later, virtuaHy every astronomer accepts the existence of black holes.

WHERE HAVE ALL THE BLACK HOLES GONE?

Like the Big Bang, black holes are an astronomical staple. Most scientists and laymen assume that black holes are proven, well-observed denizens of the cosmos. Certainly the media entertains no doubts! Let us take a skeptical look.

Does theory require black holes? In 1939, R. Oppenheimer and H. Snyder showed on paper that a massive star could collapse and create a black hole, assuming the correctness of stellar theories and General Relativity. Initially, scientists were skeptical about black holes because of their bizarre properties: They emit no light and inhale unwary starships. Black holes are also singularities, and singularities make scientists nervous. In the black-hole singularity, thousands of stars are swal- lowed and compressed into an infinites- imally small volume. (Ref. 1) This grates against eommon sense.

The philosophical uneasiness about black holes is worsened by the discovery that they:

> **...threaten the universe with an ir- reversible loss of information, which seems to contradict other laws of physics. (Ref. 2)**

Adding to these problems are nag- ging doubts about General Relativity, which underpins black-hole theory. Recently, some theorists have shown that General Relativity requires that two bodies of approximately equal size not attract one another! (Ref. 2)

Despite all these qualms, black holes have become a fixture of astronomy be- cause they promise to explain the incred- ibly powerful energy sources seen in the cores of galaxies.

Do astronomers really observe black holes? The answer is: MAYBE. And even if YES, there are not nearly enough of them to satisfy theory.

To illustrate, aecording to present theory, when stars weigliing in at less than three solar masses collapse, they become neutrón stars; if larger, the stars turn into small black holes. Theo- retically, ■ there should be one small black hole for every three neutrón stars. But with some 500 neutrón stars already pin- pointed, only 3 "possible" smaU black holes have been given votes of confi- dence; namely, Cyg X-l, LMC X-3, and AD 620-00. All objeets previously pro- claimed to be small black holes have instead turned out to be neutrón stars. (Ref. 1)

The case for massive black holes weighing in at millions of solar masses is not overwhelming either. These are supposed to lurk in the centers of gal- axies. To find them, astronomers look for intensely bright spots in galaxies,

around which swirl stars at speeds approaching the speed of light as they are sucked into the black hole's maw. Such fantastic celestial maelstroms do seem to exist, as evidenced by "some- thing" in the giant elliptical galaxy M87. (Ref. 1)

New claims for massive black holes are always being put forward. The spi- ral galaxy NGC 4328, for example, is thought to harbor a supermassive black hole weighing in at 40 million solar masses! (Ref. 3) However, claims for massive black holes are also being shot down all the time. Several have thought they had found a massive black hole at the center of our own galaxy. This no longer seems likely. (Ref. 4)

Conclusión. Don't be too quick to accept such bizarre constructs as black holes, whether small or massive.

(Ref. 1. Parker, Barry; "Where Have All the Black Holes Gone?" Astronomy, 22:36, October 1994. Ref. 2. Flam, Faye; "Theorists Make a Bid to Elimínate Black Holes," Science, 266:1945, 1994. Ref. 3. Cowen, R.; "New Evidence of a Galactic Black Hole," Science News, 147: 36, 1995. Ref. 4. Goldwurm, A., et al; "Possible Evidence against a Massive Black Hole at the Galactic Center,". Nature, 371:589, 1994)

posed of Ordinary Matter may be orbited by Mirror-Matter planets. Expanding along these lines, whole star systems could be 100% Mirror Matter, and we'd never see them at all.

How about Mirror-Matter asteroids and meteors zipping around our solar system—invisible but palpable and threatening? As a matter of fact, it has been speculated that the still-mysterious Tunguska Event of 1908 (lots of energy but no cráter) was an encounter with a Mirror-Matter meteor. (Ref. 3)

(Ref. 1. Osorio, M.R. Zapatero, et al; "Discovery of Young, Isolated Planetary Mass Objects...," Science, 290:103, 2000. Ref, 2. Chown, Marcus; "See-Thru Suns," New Scientist. p. 28, November 11, 2000. Ref. 3. Reynolds, David; "Mirror Image," Science News, 158:291, 2000.)

Cross reference. See p. 299 for more on mirror matter.

PHENOMENA OF INTERSTELLAR SPACE

WANDER1NG OBJECTS IN THE VOID

THE DRIFTERS

Sure, there may now be or once have been primitive life forms on Mars, but there does seem to be a serious shortage of carbon-based life forms elsewhere in the universe. In fact, there seems to be a great dearth of smaU, cool, solid, water-and-carbon-rich planets circling beneficent suns. Can it be that we are looking for extraterrestrial life in the wrong places? Life may have originated and prospered on the multitude of sun- less aggregations of matter drifting through the void, some doubtless quite cióse to us.

Myriad nomadic planets may be roaming our Galaxy free from the clutches of parent stars. Two teams of astronomers think they have detected 25 of these free-floating planets, and say there could be hundreds of mil- lions of them wandering the Milky Way.

These free-floaters or "drifters" were created when small clouds of gas and dust coalesced under gravity's urging. If such collapsing clouds were less than 80 times Jupiter's mass, they would not be able to sustain nuclear reactions and become long-lived stars. Many would be- come "brown dwarfs." Still smaller aggregations—less than 14 Jupiters-------- would never shine at all. These would remain warm for a while as they dis- sipated the gravitational energy that created them. Such small objects would be temporarily detectable by infrared telescopes. Hundreds of such infrared "point sources" turn up in sky surveys. These are the only "drifters" we can detect. "Drifters" that have already cooled off are certainly out there by the hundreds of millions.

(Muir, Hazel; "The Drifters," New Scientist, p. 14, April 1, 2000)

Comments. Seience-fiction writers have not neglected the "drifters" as potential sourees of intelligent life. F. Hoyle's The Black Cloud is a good example of the genre. Who can say what "plasma entities" might have emerged over the eons on these multitudinous drifters? To illustrate, if you were given only the known properties of the Chemical ele- ments and a primitive earth, would you predict that matter would spontaneously mold itself into human beings? Even on earth, on very small scales, we see "plasma entities" like ball lightning and "spooklights" behaving mighty strangely! Who knows what is trans- piring on the drifters,

INVISIBLE SONS AND MAYBE SEE-THRODGH PLANETS, TOO

Astronomers have been baffled lately by the discovery of planets wandering aimlessly through outer space apparently without the guidance of a central sun. (Ref. 1) Planets, you see, are supposed to have been formed in the dises of dense dust orbiting newly created stars. They have no business wandering through the void unattended.

No problem, says R. Frost of the University of Melbourne, "They could be in orbit around Invisible Stars! (Ref. 2)

If we can have Missing Matter, we suppose that Invisible Stars are not as ridiculous as they sound. It is postu- lated that Invisible Stars are composed of Mirror Matter, a new construct of astronomers who are desperately trying to explain their burgeoning files of celestial anomalies. Mirror Matter is strange "stuff." It interaets with Ordi- nary Matter only through gravity, it doesn't emit light. It is palpable but invisible. (This sounds weird, but no weirder than quantum mechanics!)

Foot also pointed out that stars com

GAS AND MOLECULAR CLOUDS

THE EARTH HAS RECENTE Y BEEN SWALLOWED BY A CLOUD OF INTERSTELLAR GAS

Using cosmic-ray data and stellar spec- tra gathered by seven satellites, P.C. Frisch, at the University of Chicago, has constructed a cosmic scenario that reminds us of F. Hoyle's Science fiction tale, The Black Cloud. According to Frisch, until just a few thousand years ago, the solar system was cruising through interstellar space that was al- most devoid of matter. Then, perhaps within historical times, 2,000-8,000 years ago, the solar system plunged into an interstellar gas cloud. This cloud is believed to be the remnant of the bubble of matter shot into space perhaps 250,000 years ago by a supernova in the Scorpius-Centaurus región.

This tenuous cloud of gas feeds matter into the solar system, some of which interaets with the solar wind and, therefore, affeets the geomagnetic field, too. Climate changes may have been caused by entry into this cloud, and very likely the flux of cosmic rays impinging on the earth would have been modulated.

(Frisch, Priscella C.; "Morphology and Ionization of the Interstellar Cloud Surrounding the Solar System," Science, 265:1423, 1994. Peterson, I.; "Finding a Place for the Sun in a Cloud," Science News, 146:148, 1994)

Comment. Note that the 2,000-8,000- year span brackets many key develop- ments in human civilization. Also, see p. 55 for a potentially serious effect this cloud may have on carbón dating. Getting back to Hoyle's "black cloud," we recall that his molecular cloud was sentient and intelligent, being a form of gas-phase life. Following Hoyle's lead. we can wonder if our real gas cloud, now seemingly mute, communicated with ancient man? "Clouds of the Gods." Sounds like a good book title! In 2001 A Space Odyssey, you'H recall that a

curious monolith "spoke" to humans. Why not a cloud?

LINES OF MASER SPOTS

Masers work like lasers, exeept they radíate microwaves instead of visible light. Natural masers have been found in the atmospheres of both earth aiid Mars as well as in interstellar space.
They form in space when electromagnetic radiation falls upon dense molecular clouds, which then reradiate the energy at frequeneies characteristic of the molecules, Armed with radio telescopes, astronomers can "see" masers as bright spots ("maser spots") in the radio sky.

R. Norris and J. Whiteoak et al, at the Australia Telescope National Facility, while surveying just 16 regions of the Milky Way between 5,000 and 30,000 light years, detected a dozen intense methanol masers (6.7-12.2 gigahertz) arranged in lines. Early thinking is that these maser spots decórate the dises of gas clouds surrounding nascent stars.
In other words, maser spots could be protoplanets. Given the small area of the sky sampled by Norris and Whiteoak, maser spots may be very common.

(Dayton, Leigh; "Microwaves May Mark Position of Protoplanets," New Scientist, p. 16, July 10, 1993)

Questions. Whence all this interstellar methanol? And where does it all go when the protoplanets coalesce into planets? Could these molecular clouds also contain those other organic compounds necessary for the creation and development of life? If so, we can speculate that life may origínate often and repeatedly as stars and planets are born.

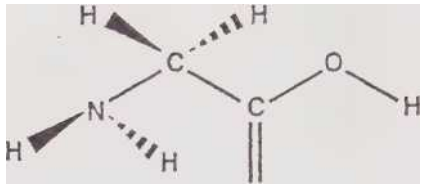
CHEMICAL SYNTHESIS IN SPACE

IT'S ACCORDING TO HOYLE AND WICKRAMASINGHE

The June 17, 1994 issue of Science could not ignore it. In fact, this conservativo journal devoted almost an entire page to a paper presented by Yi-Jehng Kuan and Yanti Miao at the recent Minneapolis meeting of the American Astronomical Society. Students of L. Snyder, at the University of Illinois, Kuan and Miao reported that the amino acid glycine had been detected in a molecular cloud named Sagittarius B2. Glycine has only ten atoms and is the smallest of the 20 amino acids vital to life-as-we-know-it. The Science article supposed that this discovery of extraterrestrial glycine might reignite speculation that earth life might not be unique after all.

(Travis, John; "Hints of First Amino Acid outside Solar System," Science, 264:1669, 1994)

What Science did not mention but New Scientist did is that F. Hoyle and C. Wickramasinghe have long predicted that



O

Chemical structure of the amino acid glycine----a rather surprising example of random synthesis of a complex molecule in a molecular cloud.

the molecules of life, as well as life itself, would be found in outer space. Now, after much ridicule, they are being taken seriously. "It's been a long hard struggle," said Hoyle. Wickramasinghe remarked that the discovery was "no surprise at all."

> He believes it is only a matter of time before other amino acids, to- gether with nucleotide bases, the com- ponents of nucleic acids that make up genetie material, are found in space. "This is just the tip of the iceberg," he says. "I would fully expect a vast array of life molecules to be dis- covered in space, and then there would be no doubt as to where ter- restrial life began."

(Hecht, Jeff; "'Molecule of Life' Is Found in Space," New Scientist, p. 4, June 11, 1994)

Comment. Here is a case where a scien- tific prediction was made, but its author labelled heretical. It is a scientifíc victory, but we guess that Hoyle and Wickramasinghe are too iconoclastic for Science to give them credit for their prediction.

INTERGALACT1C MAGNETIC FIELDS

SODRCELESS MAGNETIC FIELDS?

Our pocket compasses attest to the reality of the earth's magnetic field, and astronomers can also measure the magnetic ñelds of the sun and some other stars. Plasmas streaming along the Milky Way's spiral arms also create galactic magnetic fields. But nowhere in the immense distances between the galax- ies do astronomers see anything that might generate even a few lines of magnetic forcé.

Nevertheless, intergalactic magnetic fields do exist. Furthermore, they are just as strong as the magnetic fields measured in the ponderously swirling, star-rieh galaxies. Given the great volume of intergalactic space, we cannot ignore these apparently sourceless magnetic fields. Because, as astrophysicist S.A. Colgate observes:

> These magnetic fields are the domi- nant free energy of the universe.

If so much energy pervades intergalactic space, it is there that we may find of the source of those perplexing high-energy cosmic rays mentioned in the following digests.

(Musser, George; "Magnetic Anomalies," Scientifíc American, 283:22, August 2000.)

Comment. Imagine that! Cosmic rays of incomprehensible energy emanating from a región where resides the dominant free energy of the universe. And yet, we see nothing there in our telescopes. Future science is going to be littered with the fragments of smashed paradigms.

When the above article was written, "dark energy" was not on science's table. See pp. 96-97.

SPACE RADIATION

GAMMA-RAY BURSTS

BLASTED BY A BEAM WEAPON ON THE EDGE OF SPACE

January 31, 1993. Aboard NASA's Comp- ton Gamma Ray Observatory.

This satellite detected a gamma-ray burst containíng ten times more energy . than any other burst ever observed. It was one hundred times stronger than any known constant source of gamma rays. Even so, careful searches with ground- based telescopes found nothing visible in the direction of the burst. Scientist B. Dingus remarked:

> It's clear that it is unique event that liberates more energy in a few seconds than any other procese in the Universe.

Gamma-ray bursts remain one of the out- standing mysteries of astroriomy. The depth of the mystery is underscored by ^he K^{an}una rays must be confined to a narrow beam by their sources, rather than being emitted in

all directions. No one knows how this focussing might be accomplished. Also, since we detect only those bursts that happen to be aimed at the earth (at a rate of about one per day), the re should be a colossal number o£ bursts that we are unaware of. Yet, we cannot divine what these common, immensely powerful energy sources are.

(Kiernan, Vincent; "Blasted by a Beam Weapon on the Edge of Space," New Scientist, p. 13, May 8, 1993)

THE MOST POWERFUL EXPLOSION EVER OBSERVED

> The most powerful explosión ever ever observed----a deep space eruption detected in January------released in just seconds a burst of energy equal to billions of years of light from thou- sands of suns. Researchers say in studies to be published today that the explosión, called a gamma-ray burst, occurred 9 billion light years from earth. What caused the explosión is a mystery.

(Anonymous; "Blast's Light May Have Been Greater Than Rest of Universe," Baltimore Sun, March 26, 1999)

Update. By 2004, considerable progress had been made in pinpointing the sources of the mysterious gamma-ray bursts.
They are now believed to be generated by supernovas.

ULTRAHIGH-ENERGY COSMIC RAYS

THIS WAS THE BIG ONE, BUT WHERE DED IT COME FROM?

October 15, 1991. American Southwest.

Photomultipliers in the Fly's Eye tele- scopes 100 kilometers Southwest of Salt Lake City recorded the havoc wrought in the upper atmosphere by the most energetic cosmic-ray particle ever mea- sured. When this tiny subatomic particle slammed into air molecules, the ensuing debris caused the surrounding atmosphere to fluoresce. The amount of light produced indicated that this cosmic ray had an energy of 3 x 10*“ electrón volts----that's equivalent to the energy of a bowling hall dropped from waist lev el. Now that’s a lot of energy for a subatomic particle!

Because cosmic raye normally lose energy as they eollide with photons in their cosmic wanderingB, astrophysicists believe that "the big one" had to have a reeent, nearby origin in order to still be so energetic. But no one has any idea where it could have come from or how it might have acquired so mueh energy. Somewhere out there in nearby space there may be a natural particle accelerator orders of magnitude more powerful than our biggest earthbound atom smashers.

(Anonymous; "The Deepening Myriery of Cosmic-Ray Origins," Sky and Telescope.' 87:12, May 1994) ----------

Comment. Actually, the source of "the big one" need not have been nearby and recent. All anomalists will recognize that this is an assumption based upon the particle's extremely high energy when it hit the eai’th. Why couldn't the particle's original energy have been much higher than 3 x 10*“ ev? Then, it could have wandered for eons. After all, it is apparent that we are already dealing with an accelerating mechanism far be- yond terrestrial experienee. Who's to say what its real potential is?

THE STORM-SWEPT COSMOS

Snug and comfy beneath our insulating atmosphere and magnetosphere, we muse glibly about voyages to the stars and wonder whether extraterrestrials may already have established galactic civiliza- tions. What we often ignore is the fact that forces and energies almost beyond our comprehension course through the cosmos. Even the starship Enterprise could not really survive out there.

Two cautionary tidits will illustrate the hazards as well as our ignorance of them.

> What could possibly accelerate a single subatomic particle to such a high speed, 99.99999999999999999 percent that of light, that it would smash into the earth's atmosphere with the energy of a hard-hit tennis ball? If you don't have a clue you're not alone. These particles are ultra-high-energy cosmic rays, whieh are billions of times more energetic than the run-of-the-mill cosmic rays that continuously bombard earth's atmosphere.

(Anonymous; "Space Streakers," Astro- nomy, 27:34, March 1999)

> Every day, the sun blows billions of tons of ionized gas, electrons and pro- tons into space—the "solar wind." Sometimes, especially near the solar máximum, this wind is punctuated by squalls and storms of dangerous high-energy particles.

Two giant solar storms erupted in 1972. Luckily, they were sandwiched between Apollo 16 and Apollo 17 missions to the moon. If the astronauts had been caught on the lunar surface during one of these storms, they would probably have died.

(Roylance, Frank D.; "Sun Puts Chill on Space Missions," Baltimore Sun, Apil 1, 1999)

Cross reference. See also gamma-ray bursts, pp. 88-89.

0. 99999999999999999999999c

Well, that's how many 9s are used in the article under review. That's how cióse to the speed of light ("c") that the so-called "high-energy cosmic rays" are travelling when they smash into the earth's upper atmosphere. More impres- sive is the fact that these speedy microscopio subatomic particles pack a macroscopic wallop. Would you believe a proton with the energy of a 120-mile- per-hour fast ball?

These super cosmic rays are so ener- getic that our galaxy's magnetic field hardly influences their trajectories at all. Astronomers really cannot tell where they come from. Even more disconcerting, the energies of these cosmic cannonballs sur- pass by many orderB of magnitude any- thing terrestrial scientists can crank up in their most powerful atom smashers. Somewhere out there, perhaps between in the vast voids between the galaxies, lurks the mother of all particle accele- rators.

(Semenluk, Ivan; "Showered in Mystery," Astronomy, 29:43, January 2001)

Comment. Of course, those cosmic voids are not really empty! See entries on molecular clouds, etc., _pp. 87-88.

REDSHIFT CONTROVERSY

~~The redshift controversy still simmers away far from the mainstream of Science, indeed, it is unwise for a scientist to daré question that red- shifts might not be measures of consmological distance. Despite the policing of this paradigm, a few heretical articles do get published. We divide our digests of some of these into two parts.~~

~~«Discordant redshifts. Some apparently physically related astronómica! objects have wildly different redshifts.~~

~~•Quantized redshifts. Certain redshift valúes seem to be "favored" by galaxies and quasars!~~

DISCORDANT REDSHIFTS

ARP BANISHED, BÜT NOT REDSHIFT ANOMALIES

Several years ago, H. Arp, a noted American astronomer, moved to Europe to continué his research beeause, in part, of the hostility of American astron- omers to his discoveries. The problem was (and still is) that Arp found galax- ies that seem to be physically interaeting and, therefore, at the same distance from earth, but yet have radically dif- ferent or "discordant" redshifts. Since redshifts are supposed to be a measure of distance from the earth, an anomaly comes into focus. This anomaly; that is, the credibility of the redshift distance scale, challenges the ideas of an expand- ing universe and the Big Bang itself.

Freed from the shaekles of American scientific correctness, Arp continúes to find embarrassing facts about the cosmos. For example, take galaxies NGC 450 and UGC 807, with redshifts of 1863 and 11600 km/s respectively:

> Six lines of evidence are presented showing that the two discordant-redshift galaxies are interaeting. One would have to invoke an enormous conspiraey of galaxies to avoid this conclusión. Yet, if accepted, this case alone brings into question the interpretation of cosmological redshift for all galaxies.

(Moles, M., et al, including Arp; "Testing for Interaction between the Galaxies NGC 450 and DGC 807," Astrophysieal Journal, 432:135, 1994) ~

But discordant redshifts are not limited to distant galaxies.

> In the Milky Way, the so-called "K-effect" shows that hot, young stars seem to be exploding away from us in every direction (i.e., they have an excess redshift right here in our own galaxy). If this had been heeded when first discovered, the expansión of the universe might never have been promulgated.

(Arp, H.; "Companion Galaxies: A Test of the Assumption that Yelocities Can Be Inferred from Redshifts," Astrophys- ical Journal, 430:74, 1994)

Both of the above quotations are from abstraéis written by T. Van Flandern in his Meta Research Bulletin, 3:51 and 3:40, 1994, respectively.

DISCORDANT QUASAR PAIRS

Over the past quarter century, H. Arp has identified dozens of alignments and "associations" of quasars and galaxies that strongly suggest real physical connections. A quasar, for example, might seem to be connected to a nearby galaxy by a trail of matter, giving the impres- sion that it had been ejected by the galaxy like a Román candle. If Arp's surmise that a physical connection really exists is correct, the quasar and galaxy should be at roughly the same distance from earth and, therefore, display the same redshift. The trouble is that the components of these "associations" often have wildly discordant redshifts. Either the physical associations are illusory or redshifts are not good celestial yard- sticks. Arp's burgeoning collection of such "associations" has been largely ignored, beeause modern astronomy and cosmology would collapse if redshifts were not indicators of distance.

To his collection of cosmological embarrassments, Arp has now added some quasar pairs. The Germán X-ray satellite Rosat has mapped 24 nearby Seyfert galaxies and discovered that half of them seem to be straddled by pairs of X-ray sources (almost eertainly high-red-shift quasars). The X-ray sources give every appearance that they have been ejected from the Seyfert galaxies. Sure enough, when the redshifts of the X-ray sources (quasars) athwart galaxy NGC-4258 were determined. they were much higher than that of the galaxy that apparently spawned them.

The response to Arp's latest challenge to the redshift paradigm (or "ex- panding universe" paradigm) was pre- dictable:

(1) Interesting but not convincing.

(2) Just a coincidence.

It is obvious that a complete re-structuring of astronomy is just too horrible for most astronomers to contémplate.

As Arp commented about the reactions to his oíd and new "associations":

> "There's a flurry of comment, worry, and anxiety, but after that, every- body slips back to the oíd way" of doing astronomy.

(Sehilling, Govert; "Quasar Pairs: A Redshift Puzzle?" Science, 274:1305, 1997)

"REDSHIFT IS A SHAKY MEASÜRING ROD"

So saith M. Burbidge, an astronomer at the University of California at San Diego. Her assertion echoes what II. Arp has been proclaiming for years. (vol. 1, p. 93); namely that some redshifts are not due to the Doppler effect and an expan- ding universe. Since redshift is the major astronomical yardstick. the whole fabric of modern cosmology would be- come unwoven if redshifts cannot be used to measure distances reliably.

We bring this subject up once more beeause Burbidge claims that some new- ly discovered quasar pairs cast doubt on redshift distance measurements. For example, she, along with Arp and Y. Chu, point to the quasar pair flanking the galaxy named Arp 220 (one of Arp's discoveries). Quasars are very energetic sources of visible light, radio waves, and X-rays. The problem with Arp-220's flanking quasars is that they have much greater redshifts than the galaxy that seems to be situated in between them. Is this just a chance association, and the quasars are really much farther away than the galaxy-----as suggested by their high redshifts? Most astronomers believe this to be the case, but Burbidge and, of course, Arp, doubt it. They point to 10 other galaxies nearby that are also straddled by quasar pairs with higher redshifts. All of these were discovered within the last four years. Are they all merely chance associations?

Arp contends that such quasar pairs are actually great masses of matter that have been ejected in opposite directions by the galaxies they flank. In this, the quasar pairs remind one of the pairs of energetic jets of matter emitted in opposite directions by many active galaxies. Astronomers readily accept these jets but emphatically reject a physical connection between the quasar pairs and the galaxies that seem to have expelled them. To do otherwise would endanger much of modern cosmology.

(Sehilling, Govert; "Radical Theory Takes a Test," Science, 291:579, 2001)

Comment. If 10 high-shift quasar pairs do not impress other astronomers, would 100 be sufficient, or 1,000?

A BRIDGE TOO FAINT

In 1971, a luminous bridge was found that apparently physically connected the low-redshift galaxy NGC 4319 with the quasar Markarian 205, which has a much higher redshift. These discordant redshifts imply that the two seemingly re- lated objeets are actually separated by an immense distance. Either the luminous bridge is illusory or the redshifts are not true measures of distance. It has been easier for astronomers to ignore the luminous bridge than cast doubt on the the redshift/distance assumption.

But ignoring an observation is not as disreputable as suppressing it. In October 2002, the Space Science Tele- seope Institute issued a press release offering a photo of NGC 4319/Markarian 205 showing no luminous bridge at all, implying it never existed.

But the photo was not printed deeply enough to even show the outer arms of NGC 4319. Many off-mainstream astronomers quickly produced very good pie- tures of the vanished luminous bridge from the original NASA photo.

(Arp, Halton; "NGC 4319 and Markarian 205 --------Why Hide a Cosmic Bridge?" Jour nal of Scientific Exploration, 17:383"] 2003.)

QUANTIZED REDSHIFTS

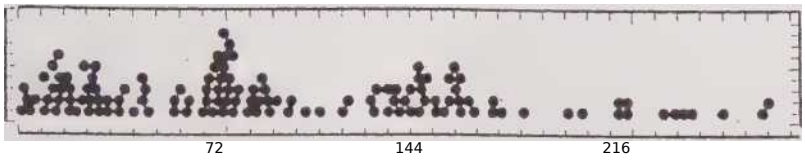
A BRIEF HISTORY OF QUANTIZED TIME

The poet Stephen Spender once observed that time is "larger than our purpose." Perhaps he should have written "times", for the various portions of the universe we can see through our telescopes may be moving along different "time lines"— on different schedules, so to speak. Ac- cording to W.G. Tifft, we may have to replace our concept of one-dimensional time with three-dimensional time if we are to explain some pressing cosmological anom alies.

It all began about 1970 OTL (Our

Time Line!), when Tifft showed that the redshifts of galaxies are quantized. To illustrate, the diagram indieates that the redshifts of binary galaxies tend strong- ly to cluster at 72 and 72/3 kilometers/ second. One would certainly not expect ponderous galaxies to orbit one another in a quantized fashion. It is almost as if binary galaxies eraulate those dumbbell- shaped molecules that can spin around only at specific frequencies! Can the mechanics of the very large (galaxies) be quantized like the very small (atoms and molecules)? Tifft obviously thinks so:

> Quantization, it seems, is a basic cosmological phenomenon. It must re- flect sume master plan.



Redshift differences of double quasars. The horizontal axis is the redshift difference in kilometers/second. The vertical axis is the number of pairs having a specific redshift difference.

The Finnish phvsioist, A. Lehto, has proposed such a plan.

> The new cosmology pictures the uni- verse as a set of timelines splaying outwards from a common origin in three- dimensional time. The "time" that we measure is related to our own line. Time along distinct fines is quantized and can even run at differ- ent rates.

If you feel as if you are walking on a conceptual quicksand, you are not alone. (Beware, the quicksand may be quantized, too!)

Tifft befieves that this new sort of cosmology can explain: (1) the observed quantized redshifts; (2) the "missing mass" of the universe; (3) "discordant" redshifts (where objeets apparently at the same distance from us have grossly different redshifts); and (4) the dieho- tomy between quantum physics and con- ventional dynamics.

(Tifft, William G.; "A Brief History of Quantized Time," Mercury, 24:13, Sep- tember-October 1995)

Comment. While the quantization of time is speculative, the quantization of redshifts has considerable observational sup- port. (See vol. 1, p. 96) For other types of quantization on cosmological scales, see vol. 1, p. 105.

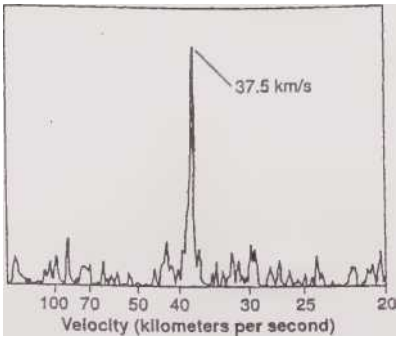
IT

> IT would mean abandoning a great deal of present research. (M. Disney, galaxy speciafist, University of Wales)
>
> I'm not being dogmaüe and saying IT cannot happen, but if it does, it s a real shocker. (J. Peebles, cosmolo- gist, Princeton University)_

Emphasis added above and for good re ason.

Yes, IT is resurgent again and after a remission of only a single issue.

We are referring to those pesky quantized redshifts that won't go away. Now, a new study of them, by B. Napier and B. Guthrie, has appeared in Astronomy and Astrophysics. These astronomers had collected the redshifts for 97 spiral galaxies, measured and remeasured by various observatories, and had found in them a strong quantization in the power spectrum. (See figure.) So unbelievable was this phenomenon that, when they first submitted their paper to Astronomy and Astrophysics, a referee asked them to repeat their analysis with another set



The power spectrum of gálaxy redshifts reveáis a strong signal at 37.3 kilo- meters/second.

of galaxies. This, Napier and Guthrie did with 117 other galaxies. The same 37.5- kilometers / second figure thrust it~ self out of the data; and their paper was accepted.

It seems. therefore, that a lot of galaxies, maybe all of them, are receding from our telescopes at velocities separa- ted by 37.5 kilometers/second, rather than in a continuous range of velocities. Unless Napier and Guthrie and, of course, W.G. Tifft, the discoverer of IT, can be proven wrong, all of modern astronomy and cosmology will be in jeo- pardy: the expanding universe, the big bang, the presumed age of the universe, not to mention the endlesB assertions that these are all facts not theories!

(Matthews, Robert; "Do Galaxies Fly through the Universe in Formation?" Science, 271:759, 1996)

LARGE-SCALE STRUCTURES

PEECOCIOUS STRUCTURE IN THE COSMOS

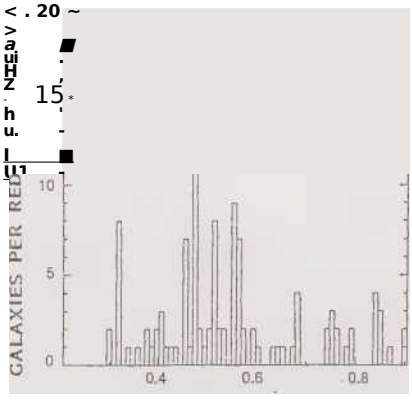
Alfied to the problem of oíd galaxies in young regions of the cosmos is the -ap- pearance of substantial amounts of structure early in the history of the universe. The new Keck 10—meter tele- scope in Hawaii has revealed giant "walls" of youthful galaxies rather than the more uniform distribution expected right after the Big Bang. There is just too much order much too early.

(Glanz, James; "Precocious Structures Found," Science, 272:1590, 1996)

TOO MUCH ORDER IN THE EARLY COSMOS

Astronomers are becoming accustomed to the idea that many nearby galaxies are concentrated in spherical shells separa- ted from one another by about 400 million fight years. This onion-skin geometry is inferred from the fací that galactic red shifts cluster around specific valúes; that is, they are quantized. Since red shifts are held to be proportional to distance in the expanding universe para- digm: Voilat We have shells! This evi- dence of nearby cosmic order does not seriously disturb cosmologists, because in the nearby galaxies we are seeing that portion of the universe that is bil- lions of years oíd. In other words, nearby there has been enough time for some degree of order to have evolved out of the primordial chaos of the Big Bang.

Now though, "deep" surveys of gal- axies, looking much farther back in time, still show clustered red shifts—not the



Redshíft clustering for distant galaxies.

expected increasing chaos required by theory. Although the surveys are incomplete, astronomers are discomfited by this early lumpiness. Their theories say that there was not enough time for galaxies to organize themselves into sheets, shells, and skeins. If further "deep" probings of the cosmos confirm this red- shift clustering, we may need a new evolutionary scenario. Good bye Big Bang and expanding universe!

(Vogel, Gretchen; "Goodness, Gracious, Great Walls Afar," Science, 274:343, 1996. Vergano, D.; "New Evidence of Cosmic Architecture," Science News, 150:239, 1996)

"A FANTASTIC RESULT!"

That's what Princeton astronomer N. Bahcall said of the discovery that the very early universe was already parti- tioned by colossal walls of galaxies hun- dreds of millions of light years long.
That walls of galaxies exist is not a new idea, but finding that they existed shortly after the Big Bang is highly disconcerting to most astronomers. How did these walls form so early? Why hasn't the forcé of gravity modified the basic structure of the cosmos over the billions of years that followed the Big Bang?

The astronómica! quandry is this: If the very early universe looks pretty much the same as today's universe, the implication is that mass, the source of gravitational sculpting, is scarce. But this is at odds with the cosmic expansión rate which implies a much higher density of matter.

(Appenzeller, Tim; "Ancient Galaxy Walls Go up; Will Theories Tumble Down?" Science, 276:36, 1997)

Comment- The existence of galaxy walls, like so many astronomical constructs, depends upon the assumption that the red shifts of galaxies are proportional to their recessional velocities and, addi- tionally, their distances and ages. So much rides on this one assumption. The same situation prevails in biology, where everything is founded on the assumption that random mutations and natural selec- tion can together generate any degree of complexity, sophistication, and innovation seen in nature. The history of Science tells us that many paradigms have fallen because they depended upon faulty assumptions.

A TWISTED COSMOS?

An astronomer really risks his or her reputation if he or she suggests that the universe has a preferred direction.
A core belief in cosmology maintains that no point or direction in the cosmos is in any way "special."

So, B. Nodland and J.P. Ralston stirred up a hornets[1] nest this past spring when they published a paper that began with this paragraph: .

> **Polarized electromagnetic radiation propagating across the Universe has its plañe of polarization rotated by the Faraday effect. We report find- ings of an additional rotation, re- maining after Faraday rotation is ex- tracted, which may represent evidence for cosmological anisotropy on a vast scale. (Ref. 1)**

Most inflammatory was their claim that the plañe of polarization of the radio waves rotated more along a particular direction [axis?]; specifically, along a line connecting the constellations Aquila and Sextans. (Ref. 2)

Only a few days after the Nodland-Ralston paper was published, it was blasted in Science. The major complaint was that their data were oíd and incomplete, since they derived mainly from observations made prior to 1980. (Ref. 3) Indeed, a similar study using more recent measurements but fewer radiation sources seems to refute the Nodland- Ralston claim of a preferred direction in the cosmos. (Ref. 4)

Nodland and Ralston disagree with the charges and the implications of the other study. It will be a while before this is all sorted out. The paradigm that Nodland and Ralston are challenging is deeply entrenched and of great philo- sophical import. (There's nothing "special" in the cosmos, especially humans!)

(Ref. 1. Nodland, Borge, and Ralston, John P.; "Indication of Anisotropy in Electromagnetic Propagation over Cosmo- logical Distances," Physical Review Letters, 78:3043, 1997. Cr. K. Partain. Ref. 2. Cowen, R.; "Does the Cosmos Have a Direction?" Science News, 151: 252, 1997. Ref. 3. Glanz, James;
"Doubts Greet Claim of Cosmic Axis," Science, 276: 530, 1997. Ref. 4. Anony- mous; "Do the Twist," New Scientist, p. 13, April 26, 1997)

THE CRYSTALLINE UNIVERSE

Cosmologists think in the large. Billions of stars are nothing to them. The mega- parsec (3,528,000 light years) is but a hop, skip, and jump. A pressing questior for these cosmologists searching for the really big picture is whether there is any order in the distribution of galaxies, galactic clusters, and superclusters.
The scale of organization of the universe is of critical importance because it is a measure of State of the cosmos when hydrogen atoms first condensed from the seething sea of ions foUowing the Big Bang. The prevailing expectation has been that galactic clusters and superclusters should be distributed at random; that is, no order prevails at that scale. Recent ridshift measurements, however, hint more and more forcefully that the huge superclusters of galaxies are almost as neatly arranged as the atoms in a crystal.

A recent paper in Nature by J. Einasto et al puts a number on the spacing of the superclusters:

> **Here, using a new compilation of available data on galaxy clusters, we present evidence for a quasiregular three-dimensional network of rich superclusters and voids, with the regions of high density separated by ~ 120 Mpc [megaparsecs]. If this reflects the distribution of all matter (luminous and dark), then there must exist some hitherto unknown process that produces regular structure on large scales.**

(Einasto, J., et al; "A 120-Mpc Periodi- city in the Three-Dimensional Distribution of Galaxy Superclusters," Nature, 385:139, 1997)

Comment. Hmmm! A "hitherto unknown process." It appears that our Bcience is stül incomplete, despite what some Science writers have insisted recently.

For more on large-scale structure in the universe, see p. 94 for the "dodeca- hedral" Big Bang..

THE FINGERS OF GOD

We present the following quotation with- out comment because "tvf" (the author) has obliged in his review of a recent article in Science.

> **Large-scale structure of the universe. A vast redshift survey of over 100,000 galaxies shows hundreds of superclusters and "Great Wall"-like structures, but also "the ends of the biggest structures in the universe". Vast dumps and dark voids are seen. [tvf: No comment is made [in Science] on the clumps and voids both being elongated in directions along our line of sight. This phenomenon is called "the fingers of God" because galaxies seem to line up in filamente pointing at us. The simplest non-theological way out of this dilemma is to jettison redshift as a reliable distance indica- tor.]**

(Van Flandern, Tom; Meta Research Bulletin, 9:48, 2000. Citing: Science, 288:2121, 2000)

BIG-BANG CHALLENGES

~~"[h® P.g. Bang is a solidly entrenched cosmological paradigm—despite its deficiencias, some of which are detailed below. As with the red-shift paradigm (p. 89+),an astronomer daring to challenge the Big-Bang para- digm becomes an endangered species. . , Ne,yertheless' w.e have amassed an ¡mpressive list of Big-Bang "pro- blems from the Science literature, as well as some thoughts about pos- sible replacements. We explore the latter flrst.~~

oBig-Bang alternatives. Steady-state universes et al.

»Big-Banq critiques. These are profuse and troubling.

MOVING BEYOND THE BIG BANG

WHERE'S THE BIG BANG'S "CRATER"?

This question was posed in a recent issue of New Scientist:

> Where the big bang happened, there must by now be an enormous hole. Where is it?

(Barber, M.G.; "Images in Time," New Scientist, p. 49, May 8, 1993.)

Comment. A silly question? Well, it is at any rate a nice introduction to our next Ítem.

THERE NEVER WAS A "CRATER"!

Humans favor tales with beginnings and endings, perhaps because we are mortal ourselves. The universe must, we sus- pect, have been created either naturally or supernaturally, and it will end either according to the Laws of Thermo- dynamics or by fíat on Judgment Day!

Some seientists, though, see other possibilities. In 1948, F. Hoyle, H. Bondi, and T. Gold proposed that the universe had no beginning and was, therefore, inflnitely oíd. Originally, they hypothesized that, as the universe expanded, new matter was continuously created, and thus the density of matter stayed about constant in time. This Steady State Universe was kicked around for a while but ultimately consigned to the cosmological wastebasket.

Now, the idea is being revived as the prevailing Big Bang Universe runs into problema, which have been docu- mented perhaps too thoroughly in past issues of Science Frontiers. The revised steady state-model has jettisoned the idea of continuous creation in favor of many discrete "creation events," which wiü doubtless be caUed "little bangs." They also fill space with small metallic needles which absorb microwaves and re- emit the fairly uniform microwave back- ground. The new theory needs more work, but Hoyle and his coüeagues write in the June 20, 1993, issue of the Astrophysical Journal:

> This paper is not intended to give a finished view of cosmology. It is intended rather to open the door to a new view which at present is block- ed by a fíxation with big bang eos- mology.

(Crosswell, Ken; "Return of the Steady State Universe," New Scientist, p. 14, February 27, 1993)

THE END OF THE OLD-MODEL UNIVERSE

That cosmology is in flux is apparent in the following sentence found in Nature:

> The standard ideas of the 1980s about the shape and history of the Universe have now been abandoned— and cosmologists are now taking seriously the possibility that the Universe is pervaded by some sort of vacuum energy, whose origin is not at all understood.

Does this mean that the Big Bang, the mainstay of the astronomy we were taught in school, is now being cast aside? After all, the Big Bang does model fairly well three important obser- vations:

(1) The apparent expansión of the universe;

(2) The 3°K microwave background; and

(3) The abundances of the light nuclei.

But try as they may, cosmologists have not been able to coax the Big Bang model to explain the large-scale lumpi- ness and structure of the galaxies and galaxy clusters. One problem with. the Big Bang is that it has too many free par ameter s—too much theoretical slack. Many cosmologists are now looking for a better model. This better model, to use the words of P. Coles, should be more "exciting" and "stranger," something "perhaps not even based on General Relativity."

(Coles, Peter; "The End of the Oíd Model Universe," Nature, 393:741, 1998)

Questions. Isn't cosmology already al- ready "strange" enough? Since when do theories have to be "exciting"? If a vacuum is defined as "a volume devoid of mass," how can it contain energy when $E = mc^z$?

A NEW COSMOLOGY

Jn the April 1999 issue of Physics Today — eertainly a mainstream publication, but occasionally daring—we find a long, technically deep article outlining a new cosmology that jettisons the Big Bang anc even redshifts as infallible measures of cosmological distances. It should come as no surprise that the authors are G. Bur- bidge, F. Hoyle, and J.V. Narlikar. The; propose a quasi-steady-state universe to replace the hot Big Bang.

It is easy to itemize narrow, speciflc problema bedeviling the Big Bang, but the three "boat-rockers" listed above alsa have an important philosophical bone to pick with modera astronomers and cosmologists.

> The theory departs increasingly from known physics, until ultimately the energy source of the universe is put in as an initial condition, the energy supposedly coming from somewhere else. Because that "somewhere else" can have any properties that suit the theoretician, supporters of Big Bang cosmology gain for themselves a large bag of free parameters that can sub- sequently be tuned as the occasion may require. *
>
> We do not think that Science should be done in that way. In Science as we understand it, one works from an initial situation, known from observa- tion or experiment, to a later situation that is also known. That is the way physical laws are tested. In the cur- rently popular forra of cosmology, by contrast, the physical laws are re- garded as already known and an ex- planation of the later situation is sought by guessing at parameters appropriate to the initial state. We think this approach does not merit the high esteem that cosmologists commonly accord it.

We have neither the space ñor the ex- pertise to lay out before you the details of the new Burbidge-Hoyle-Narlikar cosmology. Suffice that it involves black holes residing in galactic centers perform- ing as "minicreation" centers, thereby replacing the one-time Big Bang creation event.

The aspect of the new theory that amazes the most is the acceptance of the Arp heresy: that sorae quasars possess intrinsic red shifts not associatéd with the expanding universe. They write:

> Nonetheless, observations over many years have accumulated good statistical evidence that many high-redshift qua- sars are physically associatéd with galaxies with very much smaller red- shifts .

So, at least some prominent seientists accept Arp's conclusions.

(Burbidge, Geoffry, et al; "A Different Approach to Cosmology," Physics Today, 52:38, April 1999)

Comment. "Minicreation events"? Creation is creation, whether the events are big or small, and any creation of any size is highly anomalous!

OUR BIG BANG LOST IN THE COSMIC CACOPHONY

There are a lot of things unsatisfaetory with the Big Bang (See above). Probably the worst of these is that awkward singu- larity at the very beginning of our uni- verse, when evérything was born from what seems to be nothing (i.e.; the quantum vacuum). This singularity, Uke dividing 1 by 0, is discomfiting to the layman and probably most cosmologists.

F. Hoyle, who passed away in 2001, long championed a Steady State universe, in which there was no beginning. He must be smiling in his grave now, be- cause several new Steady State universes are being cooked on cosmology's baek burner. You can decide-----philosophically speaking—whether the ideas presented below are any more appealing than staring into the Big Bang's gaping singularity.

In the so-called "ekpyrotie" or "Big Splat" Steady State universe now making the rounds:

> Two infinite branes [i.e.; membranes] — our own universe and a "mirror universe"—live a tiny fraction of a meter apart. "If you wait long enough, the branes approach one another," says [P.] Steinhardt. They collide, and the energy of that collision creates all the matter and energy in our universe. The membranes bounce and sepárate again. The newborn universe, on its own brane, then evolves and eventually burns out.

(Seife, Charles; "Enternal-Universe Idea Comes Full Circle," Science, 296:639, 2002)

Another species of Steady State universe is an immensely larger versión of the oíd Hoyle-type Steady State visión. Actu- ally, our familiar Big Bang is not chal- lenged directly, it is merely marginalized as a "puny event" among many others in an eternal, changeless other dimensión.

We might compare this sort of Steady State universe to a cosmic boiler in which:

> Big Bang universes of ordinary space-tirae like ours bubble off from an underlying superdense, superhot space that continúes inflating at a superfast rate forever.

(MacRobert, Alan; "Steady State Theory Getting the Last Laugh," Sky & Tele- scope, 103:19, February 2002)

Comment. Yuk!

WAS THE BIG BANG DODECAHEDRAL?

A decade ago (p. 211), we reported on seismographical data suggesting that the solid iron core of the earth was crys- talline in nature. It is thought that this iron is a high-pressure phase of iron organized in close-packed hexagonal geo- metry. Now, there are data supporting the idea that the universe-as-a-whole is dodecahedral; that is, organized as a regular 12-sided figure with pentagonal faces---this being the highest order regular solid in geometry. If this is all verified, nature obviously prefers order- liness on all scales.

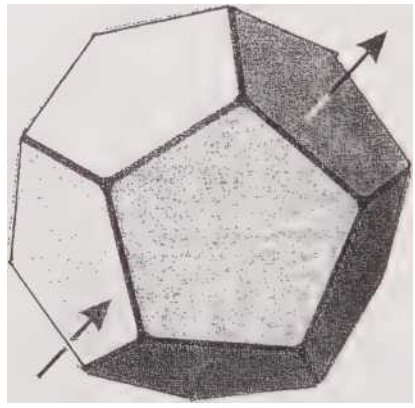
The observations suggesting that the debris from the Big Bang explosión was nicely geometrical carne from the Willdn- son Microwave Anisotropy Probe (WMAP). One’s expectation from terrestrial ex- perience, though, is that explosiona ^ do not produce highly organized debris patterns.

Contrary to such naive expectations, the WMAP data seem to show that the universe's temperature correlations van- ish at large scales. In non-technical terms, the implications are that the universe is not infinite and, furthermore, does possess regular structure. The geometrical shape that best accounts for the missing long waves is a dodecahedron. Of course, this is still aH very tentative and under review.

But we cannot refrain from mentioning two amusing effects dictated by a dodeca- hedral universe.

•Photons, spaceships, and other ob- jects passing through decadehdral space would experience a twist. The universe- as-a-whole would, therefore, possess handedness. Could this be related to the handedness (chirality) exhibited in all terrestrial biochemistry?

•If a spaceship crossed one of the twelve faces of the postulated dodecahedron, it would appear instantly outside the opposite face of the dodecahedron.



An object entering one dodecahedral face theoretically instantly reappears through the opposite face. Object source and destination not specified in article!

Sure, this is all counterintuitive, but so is quantum mechanics.

(Lurainet, Jean-Pierre, et al; "Dodecahedral Space Topology as an Explanation for Weak Wide-Angle Temperature Correlations in the Cosmic Microwave Back- ground," Nature, 425:593, 2003. Seife, Charles; "Polyhedral Model Gives the Universe an Unexpected Twist," Science, 302:209, 2003)

Comment. This dodecahedral manifestaron of the Big Bang is still beset, despite its geometrical appeal, by the Big-Bang weaknesses enumerated above. Now, an amusing aside.

Some 2,500 years ago, sans WMAP, Timaeus of Locri, noting the mystical correspondence between the four "ele- ments" of nature (fire, air, earth, and water) and the four other regular solids (tetrahedron, cube, octahedron, and icosahedron), ventured that the remain- ing fifth regular solid, the dodecahedron, must envelope the universe.

(Giomini, Claudio; "Timaeus's Insight on the Shape of the Universe," Nature, 425:899, 2003)

BIG-BANG CRITIQUES

DLD THE UNIVERSE HAVE A BEGINNING?

> Abstract. The big bang theory postu- lates that the entire universe origi- nated in a cosmic explosión about 15 billion years ago. Such an idea had no serious constituency until Edwin Hubble discovered the redshift of galaxy light in the 1920s, which seemed to imply an expanding universe. However, our ability to test cosmological theories has vastly im- proved with modera telescopes cover- ing all wavelengths, some of them in orbit. Despite widespread acceptance of the big bang theory as a working model for interpreting new findings, not a single important prediction of the theory has yet been confirmed, and substantial evidenee has accumu- lated against it. Here, we examine the evidenee for the most fundamental postúlate of the big bang, the expansión of the universe. We conclude that the evidenee does not support the theory, and that it is time to stop patching up the theory to keep it viable, and to consider fundament- ally new working models for the ori- gin and nature of the universe in better agreement with the observations .

This paper's author, T. Van Flandern, dismis ses quickly two pillars of the Big Bang; i.e., its supposed predictions of the cosmic microwave background and the abundances of light elements in the universe:

> The big bang made no quantitative prediction that the "background" radiation would have a temperature of 3 degrees Kelvin (in fact its inítial prediction was 30 degrees Kelvin); whereas Eddington in 1926 had al- ready calculated that the "temperature of space" produced by the radiation of starlight would be found to be 3 degrees Kelvin. And no element abun- dance prediction of the big bang was successful without some ad hoc parameterization to "adjust" predictions that otherwise would have been judged as failures.

(Van Flandern, Tom; "Did the Universe Have a Beginning?" Meta Research Bulle- tin, 3:25, September 15, 1994)

TEN STRIKES AGAINST THE BIG BANG

T. Van Flandern, editor of the Meta Research Bulletin, has compiled a list of Big-Bang problems-----and it is not a short list. Can the Big-Bang paradigm be that shaky? Like Evolution and Rela- tivity, the Big Bang is usually paraded as a proven, undeniable fact. It isn't.

(1) Static-universe models fit the data better than expanding-universe models.

(2) The microwave "background" makes more sense as the limiting temperature of space heated by starlight than as the remnant of a fireball.

(3) Element-abundance predictions using the Big Bang require too many adjustable parameters to make them Work.

(4) The universe has too much large-scale structure (interspersed "walls" and voids) to form in a time as short as 10-20 billion years.

(5) The average luminosity 9f quasars must decrease in just the right way so that their mean apparent bright- ness is the same at all redshifts, which is exceedingly unlikely.

(6) The ages of globular clusters ap- pear older than the universe.

(7) The local streaming motions of galaxies are too high for a ñnite universe that is supposed to be every- where uniform.

(8) Invisible dark matter of an un- krown but non-baryonic nature must be the dominant ingredient of the entire universe.

(9) The most distant galaxies in the Hubble Deep Field show insufficient evidence of evolution, with some of them apparently having higher redshifts (z = 6-7) than the faintest quasars.

(10) If the open universe we see to- day is extrapolated back near the be- ginning, the ratio of the actual den- sity of matter in the universe to the critical density must differ from unity by just one part in 10“”. Any larger deviation would result in a universe already collapsed on itself or already dissipated.

(Van Flandern, Tom; "Top Ten Problems with the Big Bang," Meta Research Bulletin, 6:64, 1997.)

It would seem that a paradigm with a total of at least thirty large cx*acks in its facade would crumble. But, this is apparently not happening!

Anyhow, we don't have space to list all of Van Flandern's twenty additional Big - Bang problems. Four added to the ten in his previous compilation will have to suffice.

- **The Big Bang prediets that equal amounts of matter and antimatter were created. If so, we don't know what happened to all the antimatter.**
- **The Big Bang violates the First Law of Thermodynamics by requiring that new space in the expanding universe be filled with "zero-point" energy.**
- **Redshifts are quantized for both galaxies and quasars, as are some other properties of the galaxies. All this is verboten under Big-Bang rules.**
- **Big-Bang theory requires that the fine-structure constant must vary with time; a claimed but controver- sial phenomenon.**

(Van Flandern, Tom; "The Top 30 Problems with the Big Bang," Infinite Energy, 8:10, no. 46, 2002)

A SUPERLUMINAL BIG BANG?

"Superluminal" objeets, such as some quasar componente, seem to travel at speeds faster than light, which, as we all know, is strictly forbidden in phys- ics. Such kinetic transgressions are usually explained as being illusory rather than real. (See our catalog Stars, Galaxies, Cosmos.)

Another variety of possible super-, luminal motion has been remarked by B. Davidheiser. (Ref. 1) He has found two descriptions of the Big Bang in which the very early universe is apparently far-exceeding the agreed-upon speed limit of physics.

Jonathan J. Halliwell in Scientific American writes that during the in- flation following the Big Bang the universe expanded from $10^{"2}$® centi- meter to about 1 meter. Also he States that this inflation lasted only 10“”" second. From these valúes the radial expansión was about 1.87×10^{22} times the speed of light. (Ref. 2)

John Boslough in Stephen Hawking's Universe states that, "Within the firsOCT^{10} second after its birth, the universe had already grown to about the size of our solar system." It takes light about 4 hours to reach Neptune from the Sun. Again, by simple arithmetic this makes the expansión of the universe during this time about 1.44×10^{14} times the speed of light. (Ref. 3)

(Ref. 1. Davidheiser, Bolton; "The ¿peed of Light," Creation Research Society, Quarterly, 30:62, 1993. Ref. 2. Halliwell, Jonathan J.; "Quantum Cos- mology and the Creation of the Universe," Scientific American, 265:76, 1991. Ref. 3. Boslough, John; Stephen Hawkin's Universe, New York, 1984, p. 100)

Comment. Were these two mainstream writers simply intoxicated by the wonder of the Big Bang and didn't check the velocities? Davidheiser was not able to elicit any explanation from the experts for these apparent suspensions of the laws under which we expect the universe to behave.

Perhaps, since the Big Bang origina- ted in a space-time "singularity," where the laws of physics are forgotten, these laws remained suspended a tiny fraction of a second after the "creation" event. If so, when did the physics we know really begin?

DARK MATTER AND DARK ENERGY

DARK MATTER

THE BOTTOM TWO-THIRDS OF A COSMOLOGICA! ICEBERG

In 1997, T. Van Flandern listed ten of the top unsolved problems facing the Big Bang hypothesis. (See above.) Actually, he was holding fire, for there are many more than ten—despite those almost weekly weakly as sur anees in the seience press that the Big Bang has now been fully proven to be solid fact!

Perhaps these frequent sales pitches of the Big Bangers goaded Van Flandern to mentioned twenty more problems with this paradigm that so tightly enchains and debilitates cosmological thinking.

IN THE DARK ABOÜT DARK MATTER

During our last two-month collecting eyele, three "dark matter" ítems worth mentioning turned up. A wider search undoubtedly would have netted many more, because dark matter is worrying a lot of astronomers,

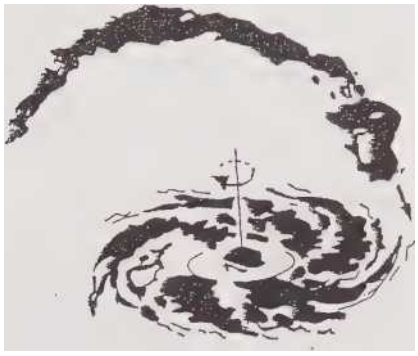
Observations of visible matter, the only kind we can see directly, suggest that most of the universe is, in fact, composed of dark matter. This conclusión comes mainly from the belief that somethihg unseen (dark matter) is tug-ging on visible matter, making it do things the laws of motion say it should not do. All visible bodies, therefore, seem to be careening about in a dense cloud of unseen, unknown masses. These might be dark, Jupiter-sized objeets, black holes, and/or some exotic forras of matter. We must choose between the reality of dark matter or admit that something is awry with our laws of grav- itation and motion when they are applied on a cosmological scale

Now, let us examine those three dark-matter Ítems from the recent literature:

- **D. Lin, a University of California astronomer, has shown that the Large Magellanic Cloud that orbits around our own galaxy (the Milky Way) is being torn apart ("cannibalized") by the powerful**

gravitational pulí of a dense cloud of dark matter surrounding the Milky Way. This dismemberment of the Large Magel- lanic Cloud eannot be explained by the gravitational forces exerted by the stars in our galaxy that we can see.
Lin calculates that our halo of dark matter is equivalent to 600-800 billion . solar masses, compared to the only 100 billion solar masses of visible matter.

(Flam, Faye; "Spinning in the Dark," Science, 260:1593, 1993. Anonymous; '"Dark Matter' Is Observed 'Cannibaliz- ing' a Galaxy," Baltimore Sun, p. 8A, June 8, 1993)



The Large Magellanic Cloud (top) is being torn apart as it spirals around our galaxy (bottom). apparently by a huge spherical cloud of dark matter that surrounds our galaxy.

•The dark matter surrounding a galaxy wiU, according to the Theory of Relativity, act as a gravitational lens that will deflect light rays passing near it. This dark matter, acting like a tele- scope, should increase the number of quasars counted in the sky near galactic clusters. Sueh larger quasar counts are indeed observed, but these increases are much larger than expected. The implication is that there is much more dark matter in the universe than pre- viously thought.

(Cowen, Ron; "Quasar Count Poses Dark-Matter Puzzle," Science News, 143:397, 1993)

•Finally, dark matter is forcing scientists to reexamine the Equivalence Principie, which asserts that gravitational mass (as in Newton's Law of Gravita- tion) is identieaí to inertial mass (as in Newton's Forcé = Mass X Acceleration).
In terrestrial experiments, the two kinds of mass are equal, but on a cos- mological seale, they may not be. There could be an extra, small (10%), long- range, non-gravitational forcé exerted between massive objects.

(Frieman, Joshua A., and Gradwohl, Ben-Ami; "Dark Matter and the Equivalence Principie," Science, 260:1441, 1993)

Comment. Apparently, we inhabit a veritable sea of dark-matter partióles that is swept by currents of equally ghostly neutrinos.

IS DARK MATTER FOR REAL?

Astronomers are confident that dark matter is out there, although what it is composed of remains a mystery. They observe that something nonluminous is gravitationally corraling billions of stars into galaxies like our own Milky Way. If it were not for the attraction of dark matter, the spiral-shaped Milky Way would fly apart because it does not con- tain enough visible matter to gravita- tionally hold it together.

Even though dark matter is invisible, we can get an idea its distrbution from the way in which it bends the starlight reaching terrestrial telescopes. For ex- ample, in Abell 901/2, a supercluster of about a hundred galaxies, the galaxies seem to be 'bunched inside huge clumps of dark matter, which in turn are inter- connected by long filamente of additional dark matter.

(Glausiusz, Josie; "A Report from the Dark Side," Discover, 23:10, August 2002)

DARK MATTER MADE OF "DILATONS"?

Mexican scientists have proposed that most of the matter in the universe (that elusive "dark" matter) may exist in the form of partióles they dub "dilatons." Dilatons might also explain the formation of the galactic shells mentioned on p. 91.

> The Mexican researchers have ex- plored a situation in which G [the gravitational constant], instead of becoming fixed after gravity separa- ted from the other forces [after the Big Bang], has continued to oscillate by a few per cent. They have found that the mass of dilatons required to allow G to vary in this way could account for ah the Universe's dark matter.

A consequence of an oscillating G would be a varying rate of expansión for the universe-----a sort of ebb and flow of the whole cosmos. One can then visualize galaxies gradually clustering together into shells much as sand par- ticles drift into ripples under the influ- ence of waves along a beach.

(Parsons, Paul; "Weird Matter Makes Gravity Wobble," New Scientist, p. 19, October 5, 1996)

MAPPING AND ANALYZING DARK MATTER

Admittedly it is difficult and even pre-sumptuous to describe something we seem to detect only through its gravitatioiiál effects upon matter that we can see. (There may be other interactions that we are so far unaware of.) Nevertheless, two interesting things have recently been deduced (tentatively, of course) about dark matter.

> The motion of planetary nebulae sur-rounding three ordinary elliptical galaxies imply that some of these galaxies lack dark-matter halos, con-trary to the theory that galaxies form from dark matter.

(Anonymous; "A Dearth of Dark Matter in Ordinary Elliptical Galaxies," Science, 301:1149, 2003. A paper by A.J. Roman-owsky, et al is available at: www. sciencexpress. com.

Considerably more profound is evidenee from the pattern of gamma rays coming from the center of the Milky Way. Dark matter affects this pattern in such a way as to imply that it is made up of
very üght partióles-----particles some 10-1,000 times lighter than the proton. This being so, every cubic centimeter in the earth's vicinity should contain a few tens of them! One would think, then, that these particles would have been detected long ago in laboratory experiments .

(Chown, Marcus; "Has Dark Matter Been Found at Last?" New Scientist, p. 8, October 4, 2003.)

DARK ENERGY

THE AC CEDERATING UNIVERSE

Many laymen are uncomfortable with the idea that the entire universe originated at an infinitesimal point and is now expan ding away from this cosmic navel.
Many astronomers are equaHy disturbed by the recent discovery that all these fleeing stars and galaxies are not being reined in by the forcé of gravity. In fact, observations of distant supernovas indicate that this exodus of matter is actually speeding up. Some universal repulsive forcé, it seems, is operating on very large scales of distance. From an unknown somewhere energy is being added to aH constituents of the cosmos. The universe is more than a cloud of debris flying away from the Big Bang's Ground Zero. Somewhere, perhaps be- yond the ken of our primitive Instruments, is a fount of energy of which we know nothing.

AH this is a serious chaUenge to our understanding of space, time, and matter. Cosmologists are now appealing to quantum mechanical "shimmers," to "X-matter," and to a property caUed "quintessence."

(Glanz, James; "Exploding Stars Point to a Universal Repulsive Forcé," Science, 279:651, 1998. Glanz, James; "Astronomers See a Cosmic Antigravity Forcé at Work," Science, 279:1298, 1998)

Comment. When theorists toss around terms like "X-matter" and "quintessence," you can be sure that the basic laws of the universe are stUl unchalked upon Science's big blackboard. God's face is still unread.

A COSMIC CENSUS

COSMOLOGY GETS REAL! REALLY?

With large new telescopes and a fleet of spacecraft with eyes sensitive to much of the electrón)agnetic spectrum, cosmolo- gists now claim they are gaining a "single picture of the cosmos."

> **But that picture is extremely odd. A mysterious forcé, known as dark energy, is pushing the heavens apart. Most of the mass of the cosmos re- mains unseen, and researchers are unsure what form this dark matter takes. The two theories that describe the Universe-----quantum meehanies and general relativity-----remain incompat able.**

The latest quantitative estimates for the composition of the cosmos are: 23% dark matter, 73% dark energy, and only 4% for stars, galaxies, and you and me! Based on this precisión, M. Tagmark, University of Pennsylvania at.Philadel- phia, asserts that cosmology has been transformed into a real, hard Science! Although, admits cosmologist M. Turner, University of Chicago, "Ninety-six per cent of the Universe is stuff that we've never seen."

(Brumfíel, Geoff; "Cosmology Gets Real," N ature, 422:108, 2003.)

Comment. How can we have a real, hard Science when 96% of it is a big, fat, albeit precisely assayed, mystery?

THE DARK SEDE OF COSMOLOGY

The June 22, 2003, issue of Science undoubtedly startled all complacent astronomers with a six-article Special Section summarizing the dark-raatter/ dark-energy challenge to cosmology. The gravity of this challenge lies in the curent inventory of the cosmos:

Luminous matter ‘	**-**	**4%**
Dark matter		**26%**
Dark energy		**70%**

Obviously, if we can see only 4% of the cosmos, it is risky to place too much confidence in paradigma based upon our observations of stars, galaxies, quasars, etc. For example, we believe the universe is expanding because the 4% of the cosmos we can see displays redshifts.
But what about that dark matter? Is it expanding too? We cannot tell.

Anyway, the first of the six articles in the Science Special Section describes how astronomers are trying to get a handle on dark matter. Since this unseen substance does exert gravitational forcé, it does bend the light emitted by the luminous 4% of the universe. We therefore really see a distorted picture of the visible cosmos. There should be what is called "cosmic sheer" warping the shapes of galaxies and galactic clusters. Some astronomers claim to have detected clumps of dark matter by mapping the distortions of visible galaxies entrained within these clumps But how can one be certain that these distorted galaxies are not just "naturally" awry—i.e., odd-balls?

(Irion, Robert; "The Warped Side of Dark Matter," Science, 300:1894, 2003.)

Questions. Did dark matter and dark energy origínate in the Big Bang? Do either dark matter or dark energy contribute to the cosmic microwave back- ground? Is there anything else "dark" out there; so dark that we haven't even guessed its existence?

Dark energy is handled gingerly in two of the six articles, one of which is introduced by:

> **Discovered less than a decade ago, a mysterious antigravity forcé suffuses the universe. Physicists are now trying to figure out the properties of this "dark energy"—the blackest mystery in the shadiest realms of cosmology.**

(Seife, Charles; "Dark Energy Tiptoes toward the Spotlight," Science, 300: 1896, 2003.)

COSMIC SPECULATIONS

WHEN DIFFERENT ÜNIVERSES RUB TOGETHER

Over the past few years, more than one theorist has proposed that our universe coexists with at least one, perhaps many, other universes. Said universes are con- stituted of particles possessing proper- ties so different from own own that we cannot normally discern the reality of these other "existences." In other words, astronomers cannot visually see the stars of these "shadow universes, ñor do our detectors of electricity and magnetism acknowledge them. Normally, the sub- atomic "shadow" particles do not interact with our own particles either. Thén, why even bother to contémplate shadow universes? Well, physicists say that none of their laws prohibits the existence of these other universes, and that's reason enough to search for a "looking-glass" entrance of some sort.

Just suppose that the partióles of one of these shadow universes do pos- sess mass (or whatever shadow physicists cali it). Some speculate that this shadow mass could be the "missing mass" that cosmologists have been looking for and can't fínd. Cosmologists need some- thing palpable out there to explain the puzzling dynamics of galaxies and other phenomena. Some physicists in our universe have conceived of a situation where our universe may "rub together" with a shadow universe. [Honestly!] During such less-than-cataclysmic en- counters, some of the electric charge on our-world particles could be "scraped off" and transferred to shadow-world particles, enabling us to íinally detect them!

This possibility obviously calis for experimente aimed at detecting other-world particles with electric charges of, say, one-thousandth of an electrón[1] s charge. The search is now underway at SLAC (Stanford Linear Accelerator Cen- ter).

(Travis, John; "How Quixotic Is SLAC's Quest to Detect 'Crazy Particle'?" Sci- Bnce, 267:1424, 1995)

Shadow Comment. Obviously, weird phe- nomena might transpire when and where universes rub together. One area of fre- quent rubbing is probably the Bermuda Triangle! Had enough? We have.

THEORIES THAT ARE HARD TO BELIEVE EXPLAIN THINGS WE CANNOT SEE

That "something" we cannot see is that astronomical fudge factor called "dark matter". Astronomers are sure it exists because its presence, though unseen, explains two anomalies:

(1) The high circular velocity of the stars and gas in the outer reaches of galaxies. Circular velocities should de- crease with distance from the galactic center, just as planet velocities do in the solar system. They don't, so some gravitational forcé from some unseen mass must counterbalancing centrifugal forcé. (Mark that this is presumptious! The "forcé" need not be gravity.)

(2) Observations suggesting that galaxies formed when the universe was less than a billion years oíd. The gravitational pulí of the visible mass is in- adequate to cause this dumping so quickly in the history of the universe.

Many candidates have been proposed to play the dark-matter role. One of the more popular possibilities is that vast sea of neutrinos pervading the cosmos— if they really do display just a hint of mass. Two other candidates now on the table are so bizarre that we marvel at the ingenuity of the theorists. One in- volves exceedingly large particles, the other unbelievably tiny clumps of particles .

At the "giant" end of the size spectrum are galaxy-size particles weighing only lO^{-2}* as much as an electrón, which is itself by no means large. It would be hard to experimentally distinguish such ethereal particles from a hard vacuum.
A Princeton team, led by W. Hu, asserts that such particles would coalesce into giant globs of "fuzzy", coid, dark matter Now if only Hu et al would tell us how to detect them!

(Pease, Roland; "Globs in Space," New Scientist, p. 5, August 26, 2000)

So-called "Q-balls" are also candidates for dark matter. Theorists claim that Q-balls were created during the Big Bang and may still be roaming the universe. Far from being ethereal,

Each one is like "a new universe in a nutshell" [A. Kusenko] says. In- side a Q-ball, the familiar forcea that hold our World together don't exist.
This has some startling consequences. It means that every Q-ball is on a mission to viólate law and order in the universe by assimilating normal matter and eompelling it to live by Q-ball rules.

Who can deny the exotic nature of Q-balls after that description? Q-balls are so tiny (about the size of an iron nucleus) and move so fast (about 100 kilometers/ second) that they can zip through a planet with scarcely any observable effect. In this elusiveness they resemble neutrinos. As a matter of fact, Japan's Kamiokande neutrino detector, which contains 50,000 tons of water surrounded by a shell of detectors, has been "blinded[1] several times by the passage of entities that could well be Q-balls. If these bizarre entities do exist, they could be that dark matter that astrono- mers insist pervades the cosmos.

(Muir, Hazel; "Cosmic Anarchists," New Scientist, p. 22, May 20, 2000)

Comment. Can astronomy cali itself a Science when it entertains theories like those above? Interestingly, in the 1920s, geology journals used almost identical critical words in connection with another too-bizarre theory: continental drift, which is now a dominant paradigm in geology!

IS A SINGULARITY WORSE THAN A SPINNING COSMOS?

Whence the untold billions of stars and galaxies that brighten our night skies? From a "singularity," that's where— from an infinitely small point in space. The Big Bang hypothesis requires this abandonment of common sense. Both mathematicians and cosmologists instinc- tively hate singularities. The latter have been trying to exorcise theirs for years. Recently, S. Carneiro, a Brazilian physi- cist, proposed a way to get rid of this natal singularity but retain the ex- panding universe. First, he assumes that the universe has been around for an indefinitely (infinitely?) long time, thereby eliminating the problem of origin. Furthermore, this universe was rotating. About 11 billion years ago this spinning universe was transformed into the ex-panding universe we see today via that clever cosmologists' ploy ealled a "vacuum phase transition." Carneiro shows how the rotation of the universe-as-a-whole was converted into overall expansión in a paper submitted to the Journal Classi- cal and Quantum Gravity.

But even if all of Carneiro's equations cheek out, angular momentum still had to be conserved somehow during the phase transition. Simple! The angular momentum of the universe-as-a-whole was trans- ferred to the spins of all the individual planets, stars, and galaxies. In fact, the angular momentum of each astronomi- cal entity, according to Carneiro, is proportional to its (mass)-*-*^. This turns out to be pretty cióse to the astonishing, still-unexplained observation that the angular momentums of planets, stars, and galaxies are proportional to their (masses)^.

(Matthews, Robert; "Cosmic Carousel," New Scientist, p. 19, December 19/26, 1998-January 2, 1999)

Questions. How did the early universe acquire its primordial spin? About what axis did it spin? Wasn't this axis a favored place that is verboten in modera cosmology? Is the Big Bang's singularity worse than all these new questions?

THE 8 GREATEST MYSTERIES OF COSMOLOGY

Such is the title of a lengthy article in the June 2001 issue of Astronomy. It is always dangerous to employ superla- tives; "greatest" is particularly hazard- ous. Any way, it is useful to review what mainstream astronomers consider to be their major unsolved problems. Naturally, we shall add a few that we think should have been on the list.

1. How multidimensional [IB] the universe? For example, gravitons, which are be- lieved to exist in a fifth dimensión, are supposed to transmit gravitational forcé. This dimensión is barely separated from our well-known four. The thin barrier separating us from the graviton universe seems to leak a bit thereby allow- ing gravity, the weakest of aH our uni-verse's forces, to exist. Sounds pretty far-out, but not as bizarre as string theory which requires many more dimen- sions!

2. How did the universe begin? The cosmic microwave background is much too smooth. If it was smoothed out by a sudden expansión of the universe (so- caUed "inflation"), what caused the in- flation?

3. Why does matter fifi the universe? in other words, where is aU the antimatter that we think must have been created in equal amounts? (This equality is a human philosophical requirement. The universe can do anything it wants!)

4. How did galaxies form? [5 6 7 8]

5. What is coid dark matter? This "sub-stance" seems to be filamente threading the surfaces of cosmic bubbles (voids).
It seems to be slow-moving and coid (no electromagnetic radiation), but no one really knows what it is. Apparently, it constitutes 30% of that part of the universe that we have so far detected. (We are doing a lot of guessing here!)

6. Are all the baryons assembled in galaxies? Baryonic matter ineludes pro- tons, neutrons, and electrons. Baryons should be abundant in intergalactie space, but they are nowhere to be found.

7. What is the dark energy? Whtever it is, scientists have so far only been able to ñame it. It is thought to be associated with a repulsive forcé that is accelera- ting the expansión of the universe.

8. What is the destiny of the universe? Will entropy do us in?

(Sincell, Mark; "The 8 Greatest Myster- ies of Cosmology," Astronomy, 29:46, June 2001)

Coroments, It is easy to add to the above list:
(1) Why does anything exist? (2)
Is there life elsewhere in the universe?
(3) Are redshifts really good yardsticks?
(4) Are there other universes?

THE FORCE IS WITH THEM

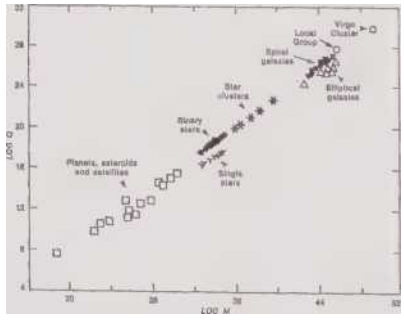
The communication loop between earth-based ground stations and interplanetary spacecraft allows extremely accurate measurements of the radial velocities of these distant man-made machines. As these spacecraft hurtle toward the fringe of the solar system, the visible sun dwindles to a small, bright point, and its gravitational ñeld falls off as the inverse square of the distance. At least that is what is supposed to happen.

Four far-flung spacecraft, (Pioneer 10, Pioneer 11, Ulysses, and Galileo are ex-periencing a mysterious decelerating forcé not encompassed by the Law of Gravitation. It's a tiny forcé, but it seems to be real. Making it even more puzzling is the fact that it is decreasing according to the inverse of distance from the sun rather than the inverse square.
Is it a non-solar forcé? Is it "new" physics? Or maybe just an artifact of the spacecraft and ground-based equipment?

The fact that four spacecraft feel its tugging suggests the forcé is real. But the motions of the distant planets do not seem to be affeeted by it. So, everyone is perplexed.

(Schilling, Govert; "Spacecraft Motions Puzzle Astronomers," Science, 281:1581, 1998. Seife, Charles; "If the Forcé Is with Them...," New Scientist, p. 4, September 12, 1998. Browne, Malcolm; "After Study, Mystery Forcé Remains One," New York Times, September 17. 1998. Cr. M. Colpitts.)

Comment. This decelerating forcé is opposite from the eosmological accele-rating forcé attributed to dark energy. What's going on here? (See pp. 96-97.)



A possible universal relationship between angular momentum and mass for various astronomical objects. Should the universe-as-a-whole be added at the upper right? (From: Science Frontiers I)

AN AGE PARADOX?

Cosmologists say the universe may be 8 to 15 billion years oíd. Stellar astronomers disagree. They say the oldest stars are much older, perhaps 16 to 19 billion years oíd. Because the oldest stars ean't be older than the universe in which they lie, this age paradox presents a thorny pro- blem for astronomers.

At least two Solutions to the paradox are possible: (1) The cosmological dis- tanee scale used to determine the age of the universe is incorrect; and/or (2) Our theories about how stars work and evolve are in error. Something has to give.

(Jayawardhana, Ray; "The Age Paradox," Astronomy, 21:39, June 1993)

Comments. Also pertinent here are H. Arp's colleetion of red-shift anomalies, which also cali into question the cosmological distance scale; and those missing solar neutrinos, which cast doubt on our ideas about how stars work.

Since the above Ítem was penned in 1993, the "missing-neutrino" problem has turned from an astronomical mystery into an anomaly in partióle physics. (p. 81)

In addition, astronomers have decided that the oldest stars mentioned above are not so oíd after all. Scientific consensus now pegs the age of the universe at about 13.7 billion years. .

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HUMANS

EXTERNAL APPEARANCE

The characteristics of Uving organisms most obvious to humans are size, color, shape, limbs,- etc. It is understandable, therefore, that most sections in this chapter commence with "external appearance" phenomena and their potential anomaly and curiosity. valué. Since the issues of Science Frontiers cannot possibly encompass all "appearance" phenomena, the reader is encouraged to consult our six catalog volumes in the Bio- logical Anomalies series for more thorough coverage.

The aspects of human external appearance found in the issues of Science Frontiers published between 1994 and 2004 and reproduced here consist primarily. of physiological oddities—except for a short philó- sophical ítem at the end. More profound entries will be discovered in later sections under "behavior," "genetics," etc.

SOME PEOPLE ARE BRIGHTER THAN OTHERS

We broached the admittedly unlikely subject of human bioluminescence in vol. 1, p. 110 and also our catalog Biológica} Anomalies: Humans I. where the major evidence was anecdotal in nature. It is now evident that we have missed an im- portant corpus of laboratory results, in which the spectra and intensity of human radiation has been measured. For example, consider the following abstract:

> **In measuring the output of light from the human skin, we estimated the total photon rates to be of the order of 170-600 photons/s/cm^2, depending on anatomical location. The light was strongest at the red end of the spec- trum, but fell below detectable levels in the ultraviolet. Signiñcant varia- tions were observed between individuáis in both photon rate and spectral profile. The photon rate also varied significantly with time for a single individual.**

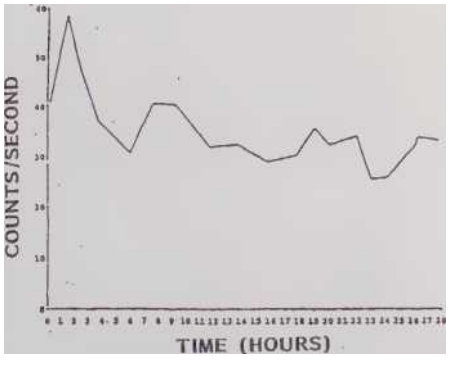
It is important to recognize that, although the flux of photons emitted by individual cells is very low, it greatly exceeded the flux of blackbody radiation at 37°C (about 10~^{9} photon/s/cm^2).

Experimente demónstrate that human bioluminescence originates mainly in body tissue, particularly skin cells, and not from skin bacteria or the blood. The authors of the present paper believe that the radiation comes from the "oxida- tion production of radicáis."

(Edwards, R., et al; "Measurements of Human Bioluminescence," International Journal of Acupuncture *&* Electro-Thera- putics Research, 15:85, 1990. Cr. M. Bischof)

Comment. Reeall that mitogenetic radiation from cells, long derided by the scientifie establishment, has now been detected. See vol. 1, p. 175.

Look above at our hard-to-find refer- ence! If we only had time to search all of the literature on the fringes of main- stream seience! We have to rely on other eyes to catch such data.



Photon emission rate for one human subject.

SUDDEN BLANCHING OF HAIR

He was not frightened by a ghost or abducted by aliens, but the hair of a healthy, 45-year-old French farmer turned from black to puré white in less that 14 days. For six months the embar- rassed man endured, but then over a period of four months, his hair grew back to fuH black.

(Nelson, Douglas; "Aaaaaargh," New Scientist, p. 93, April 11, 1998)

HAIRY RARITY

Ordinarily, we avoid two-headed snakes, six-legged calves, and the like. Some- times biological machinery sputters a bit and freaks (terata) result, just as Detroit assembly lines turn out lemons once in a while. Occasionally, though, we come across a defect so rare and curious that we must pass it along. So, here is the Summary of a serious scien- tific paper, along with a sketch, that satisfies our Fortean urge.

> **A Burmese family with congenital hypertrichosis lanuginosa [excessive hairiness] had an eventful history in the nineteenth century. The ear- lier members of this family were em- ployed at the court of A va, but the later ones spent their lives in show business, being widely exhibited for money in the 1800s. Their extraordi- nary hairiness attracted much curiosity, and they were photographed several times. The hairy Burmese are the only example of a four-generation pedigree of congenital hypertrichosis lanuginosa, which is consistent with an autosomal dominant mode of inheritance. There is good evidence that, when members of this family were hairy, their dentition was also deficient.**

(Bondeson, J., and Miles, A.E.W.; "The Hairy Family of Burma: A Four Generation Pedigree of Congenital Hypertrichosis Lanuginosa," Royal Society of Medicine, Journal, 89:403, 1996. Cr. A.C.A. Sük)

A hairy, 31-year-old Burmese woman with her 14-month-old son, who has long hair growing from his ear.

HAND-READING MORE DSEFDL THAN PALM-READING?

After learning that mutations in a single gene in mice affected not only the de- velopment of their digits but also their ovaries and testes, J. Manning and his colleagues decided to see if there is a link between human hand shape and fer- tility. There is!

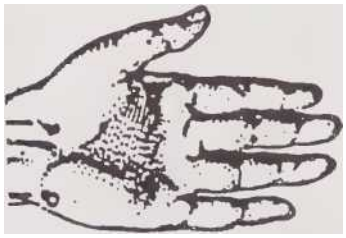
Men with hands that are not precise mirror images of éach other tend to produce fewer sperm. Manning asserts, "The more asymmetry, the fewer sperm." _

Easier to test yourself are the relative lengths of your ring and Índex fingers. Men tend to have ring fingers that are longer than their Índex fingers. The greater this difference in males, the higher their levels of testosterone, a hormone associated with fertility.

In women, the same fingers are usually about equal in length. However, in con-

trast to males, larger índex fingers are correlated with the increased presenee of fertility hormones, sueh as estrogen and lutenizing hormones.

(Motluk, Alison; "Fertility Index," New Scientist, p. 10, August 22, 1998)



A virile man's hand? Probably!

ANOTHER SKIN SHEDDER

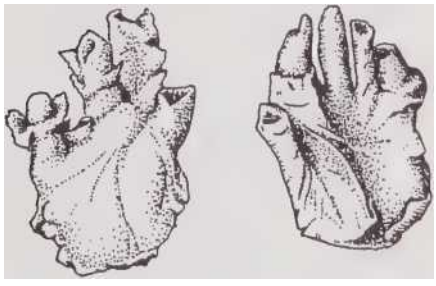
In our catalog Biological Anomalies: Humans II, we defíne skin-shedding as follows:

> The rapid, complete shedding of the skin in large sheets, after the fashion of reptiles. This eurious exfoliation often occurs on a rather precise annual schedule.

Bizarre though this phenomenon is, we have cataloged several cases. Now, a 1908 issue of the New York Times has yielded still another instance.

> For the twenty-eighth time in the last fifty-three years, William ü.
> Cake, a Unoleum printer, of 25 Cleveland Avenue [Trenton], is shedding his skin as a snake does. Instead of periodical casting aside of the cufíele, Cake is likely to shed his skin at any time.
>
> Cake has been afflicted with this skin-shedding malady since childhood. First, he is taken with a chill, then the skin dries up, cracks, and peels off entirely within two weeks. During this period he suffers agony because of itching. But as soon as the skin has been shed, Cake is all right again. He has several children, but none of them has manifested any symp- toms of skin shedding.
>
> The longest interval that Cake remembers in which the malady did not manifest itself was nine years, but his skin generally comes off once in two years.

(Anonymous; "Sheds His Skin Like a Snake," New York Times, July 30, 1908. Cr. M. Piechota)



Skin shed from the hands of S.C. Bus- kirk, another "skin-shedder." Details in our catalog Humans II. '

NUCLEAR FAMILIES

Men who work at England's Sellafield nuclear power plant father significantly more sons than daughters. Male plant workers produced 109 boys for every 100 girls. This compared with 105 boys for every 100 girls for men in the same area who did not work at the plant.

The bias was even greater for men who had received higher than normal doses of radiation in the 3 months prior to conception: 140 boys per 100 girls.

Actually, both sets of figures are significant because of the large sample employed: 260,000 children.

(Anonymous; "Does Atomic Plant Genérate Sons?" Baltimore Sun, December 12, 1996)

Comment. The average sex ratio world- wide falls between 104-107 boys per 100 girls. There are, however, some fasci- nating geographical extremes:

Montserrat	94.34
Aden	120.31

Why do these large differenceB prevail? Is Aden radioactive? For more on this subject, see our Catalog: Biological Anomalies: Humans II.

PEOPLE WHO ARE NOT ENTIRELY THEMSELVES

Human ehimeras, like the Chimera of Greek mythology, are biologically forged from two or more different animáis. In the Greek Chimera, the species were different; in human ehimeras there is only one species but different individuáis.

Human "blood "ehimeras" are the most common. These individuáis have more than one blood type. Most blood ehimeras are nonidentical twins who shared blood in the womb. But a few blood ehimeras were single births because their twin died in útero and was absorbed. Some fetal blood may diffuse through the placenta into the mother's veins. Mothers may therefore circuíate a few alien male or female blood cells. The reverse can happen, with the mother's blood cells diffusing into the blood of the embryos. Some autoimmune diseases may result from this imperfect separation of blood.

A condition called "mosiacism" is more common than blood chimerism. This occurs when a mutation occurs during early growth of the embryo. Aв a result portions of the grown individual will differ from each other because their cells' genomes are not identical. For ex- ample, in a condition called "trisomy," patches of tissue in a single individual may be composed of cells each with an extra chromosome.

Trisomy often results in a strange variation in skin pigmentation called Blaschko's lines. These are V-shaped lines seen on the back. The lines are most prominent under ultraviolet light.

Blaschko's lines on the back of a human mosaic. These lines are best seen under ultraviolet light.

(Pearson, Helen; "Dual Identities," Nature, 417:10, 2002.)

Comment. Autism may arise when patches of brain tissue differ from one another and do not eommunicate well.

Most human ehimeras are not easily identified from external appearanees, as above. See p. 111.

IS LIFE A TRANSITORY PHENOMENON?

We don't mean just life on earth, where it has hung on for a couple billion years, but life anywhere in the universe.

Many cosmologists advance the so-called Anthropic Principie, which States that the physical constants of nature are honed to just the right valúes to make life possible. If the charge on the electrón were a little less or the proper- ties of carbón a bit different, life could not exist. The Anthropic Principie seems to imply that the universe was designed for earth life. But "design" is a bad word these days. It is redolent of pur- pose and a supernatural being. Suppose, though, that the Anthropic Principie is correct but only in our part of the cosmos and only for a little while. If the constants of nature are not reaUy con- stant, life could be just a transitory phenomenon, flaring up here and there wherever conditions are ripe and the Anthropic Principie reigns. The cosmos as-a-whole might be lurching toward other goals or, perhaps, toward nowhere in particular.

These general editorial musings were encouraged by an article in Scientifíc American on the subject of "inconstant constants" in physics and astronomy. Our digest of this article is on p. 301. but we thought its implications for humankind should be repeated here.

(Musser, George; "Inconstant Constants, Scientifíc American, 279:24, November 1998.)

Comment. Even as we write, some dis- tant part of the cosmos may be coming into estrus for life-as-we-do-not-know- it. A rather depressing view of human- ity's future in outlined in vol. 1, p. 341, in an entry entitled "Already, now, we are forgotten on those stellar shores.

BEHAVIOR

KNISMESIS AND GARGALESIS

This Ítem is not as serious as its pretentious title. Everyone has experienced both of these omlnous-sounding physiological conditions.

One can inflict knismesis upon one's self, but gargalesis requires someone else or perhaps a human-like robot (android) to perform the act.

All right, so knismesis and gargalesis are really only the two recognized kinds of tickling; but the latter form stimulates several interesting physio- logical conundrums.

First, let's sepárate the two conditions. Knismesis is very light stimula- tion of the skin, say by a feather. It rarely produces laughter and can be induced autonomously, by someone else, by a crawling insect, or even by mild electricity. Gargalesis cannot be self- induced. It consists of heavier pressures applied to specific parts of the body, especially the ribs and arm pits. But the finger probing usually has to be done by someone else. Gargalesis is often very unpleasant but is neverthe- less likely to be accompanied by smiles and laughter. In fact, gargalesis can be so disturbing that medieval torturers supposedly tickled same of their victims to death! (A variant of Chínese water torture?)

Tickling becomes anomalous only wíth gargalesis. The questions are:

(1) Why does this kind of tickling elicit laughter when it is so unpleasant?

(2) Why cannot one tickle one's self this way? At least most people can’t.

(3) Why does gargalesis exist? What survival valué does it have? Is evolu- tion just having fun with us?

C.R. Harris is a tickle researcher and has even designed a (fake) tickling machine to test her subjects. She believes she knows why we laugh when we are subjeeted to gargalesis.

> ___the smiling and laughter encourage the tickler to continué. If tickling produced a negative facial expression, conspecifics would be far less likely to engage in it during playful bouts-----thus cutting off the development of combat skills that might have survival valué.

Translation: tickling-plus-laughter promotes the roughhousing needed to develop combat skills. Chimps, deer, and most young mammals engage in similar sport for the same purpose; but, as far as we can tell, without the laughing.

The inability to self-tickle is hard to understand. After all, we can easily produce a knee-jerk reaction by tapping our own knee. Why can't we tickle our own ribs? Perhaps because our brain Controls the action and also caneéis out signáis to pulí away from the tickle and laugh. It could be the unpredict- ability of someone else's tickling that makes it so effective. Yet, when the tickler tickles our shoulder rather than our ribs, nothing happens. Strange!

Why would evolution have given humans highly specifío tteklish areas that respond only to other people and, to boot, makes us laugh? What survival valué is there in this? In the end, Harris has to admit that tickling may not be adaptive at all, but rather an almost-neutral side effect genetically linked to some different charaeteristic that is adaptive. Mother Nature's joke on us?

(Harris, Christine R.¡ "The Mystery of Ticklish Laughter," American Scientist, 87:344, 1999)

THE RIGHT WAY TO KISS

During the final weeks in the womb and the first six months of life, humans preferentially turn their heads to the right. This tendeney persists in adult- hood according to O. Gunturkun, who carefully observed 124 kissing couples at airports, railway stations, beaches, and parks. She only counted kisses with full-lip contact; no quick brushes to the cheeks! Fully 64.5% of the couples who met the kissing criteria turned their heads to the right.

This roughly 2:1 ratio of right/left kissers does not jibe with the human handedness ratio of about 8:1.

(Gunturkun, Onur; "Adult Persistence of Head-Turning Asymmetry," Nature, 421:711, 2003)

Comments. What happens when a right-kisser falls in love with a left-kisser?

OXYGEN DEPRIVATION AT HIGH ALTITUDES AND THE ENHANCEMENT OF REPRODUCTION ECSTASY IN ADVANCED MAMMALIAN SPECIES

Sex in high-flying airplañes is more fun!

(Jones, David! "Romantic Airs," Naturo, 379: 680, 1996)

FIDDLING UP WORMS

When fishing season arrives in TenneBsee, L. Harvey does not get out his shovel ti. dig for worms, he gets out his saw!

> Using a dull handsaw, Harvey cut a dead dogwood tree down to a 10-inch stump and then began sawing it lengthwise—an act of worm fiddling that sounded like someone playing the bassoon, and made the ground purr beneath our feet.
>
> At first, Harvey's sawing seemed to agítate only inseets and spiders, but after a while we saw our first fiddled worm. It was 6 inches long, wriggling next to Harvey's boot.

Twenty worms at each site are about average with Harvey's fiddling. His fiddled worms are top fish-catchers_; the slime they produce even glows in the dark. Harvey is a purist and es- chews modern worm-catching technology, such as those popular iron stakes driven into the ground and connected to a car's battery.

(Simmons, Morgan; "Making 'Music' with Saw and Stump," Knoxville News-Senti- nel, April 21, 1996. Cr. J.A. Caywood)

Comment. See vol. 1, p. 148 on how to "grunt" for worms with a driven stake and notched stick—a variation of Harvey's technique. Incidentally, a few birds and even a turtle have learned to grunt for worms!

TOO IDENTICAL!

> Identical twins were admitted to the same hospital with the same injury after sepárate accidents within the space of an hour. Liam Lynch, 6, of Cookham Rise, Berkshire, broke his collar bone climbing his garden fence, and his brother suffered the same fate after tripping while running. Both were taken to Wycombe General Hospital.

(Anonymous; "Twins' Identical Mishaps," London Times, April 6, 1994. Cr. A.C.A. Silk)

Cross reference. Additional cases of the nearly simultaneous deaths of identical twins are collected in our catalog Bio- logical Anomalies: Humans II.

LACRIMA MORTIS: THE TEAR OF DEATH

It must be a heart-wrenching experience to see a single tear roll down the cheek of a person at the moment of his or her death. I. Lichter, medical director of the Te Omanga Hospice, in New Zealand, wondered how often this phenomenon occurred and why. Working with the Hospice nursing staff, Lichter followed 100 patients nearing death.

> The resulta showed 14 patients shed a final tear at the time of death, and a further 13 within the last 10 hours of life.
>
> In 21 of the 27 cases, the dying person was unconscious at the time of the last tear. And in all but one case the tear was shed by patients whose death was expected rather than sudden.

Lichter and colleagues wondered if the death-bed tears were emotional in origin or perhaps caused by a reflex action. Notes made by the nursing staff were inconclusive on this matter. Lichter thought of chemically analyzing some of the last tears, because emotional tears have a different Chemical composi- tion from those produced by irritation. Unfortunately, a single tear was insuffi- cent for the analysis.

(Morrison, Alastair; "The Mystery of the Death-Bed Tear," Wellington Dominion, August 11, 1993. Cr. P. Hassall)

ARE HUMAN TEARS IRREDUCIBLE COMPLEX?

Today, a claim is being put forward that some aspects of life are irreducibly complex and must, therefore, have been intel- ligently designed. It is, therefore, not surprising that the title's question was posed in the ereationist journal TJ (for Technical Journal).

We will not take this question head- on, but we will take a look at tears, cspeciaHy human tears.

The TJ artiele recognizes two types of tears:

(1) "Housekeeping" tears that cleanse the eye; lubrícate it with oils, mucins, and electrolytes; and ward off infections with bacteria-fíghting sub- stances. This type of tear is common in animáis and, one must admit, a rather complex substance but probably not irreducibly so.

(2) "Emotional" tears that flow under stress and trauma. These are chemically quite different from housekeeping tears, as explained by J. Bergman, author of the TJ artiele.

> Emotional tears are a response unique to humans, because only humans can weep. All animáis that have eyes and live in the atmosphere produce tears to lubrícate their eyes. but no creatures except humans pos- sess the marvelous system that causes crying. Interestingly, crocodiles secrete tears while eating their prey for reasons that are yet unknown. Scientific studies have shown that many people feel better both physi- cally and physiologically after crying; conversely, suppressing tears usually causes people to feel worse.

It has, in fact, been demonstrated that emotional tears eontain many more toxic biological byproducts than housekeeping tears. Emotional tears thus re- move the undesirable byproducts of stress and contribute to well-being.

(Bergman, Jerry; "The Design of Tears: An Example of Irreducible Complexity," TJ, 16:86, 2002)

Comment. We see a conflict in the litera- ture. Bergman gives two solid references for his assertions that only humans cry emotional tears. This is consistent with the ereationist position that humans are profoundly different from animáis. However, in our catalog Biological Anomalies: Humans II, we have references that claim that marine mammals and elephants also emit emotional tears. Admitíedly, it is hard for us to gauge the emotional States of other animáis, but the observational evidence for nonhuman emotional tears cannot be ignored.

It is fascinating to remark that the creationists wish to distance humans from other animáis, while those asserting the existence of nonhuman emotional tears are promoting the Aquatic Ape Hypothesis.

Emotions flow copiously in these matters!

WHY SOME LIKE IT HOT

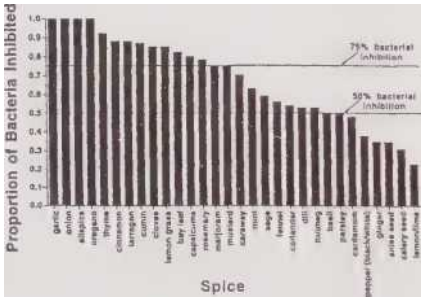
That's spicy "hot," not temperature "hot." As travelers can attest, the warmer regions of our planet offer the spicier foods. In a way, this observa- tion is a proof of microevolution. The "fítter" people (that is, "survivors") in hotter climes are those who have inherited a taste for hotter foods.

Spices eontain Chemical eompounds that inhibit or kill the bacteria and fungí that are more likely to poison foods where ambient temperatures are higher. Eaters of spicier foods are more likely to survive in these areas.

This is not just a surmise. A study of 4578 recipes from 93 cookbooks from all over the world have been analyzed for spice contení. Sure enough, the hotter the climate, the more recipes using spices and the hotter the spices used. In the language of Science:

> The proximate reason spices are used obviously is to enhance food palata- bility. But the ultímate reason is most likely that spices help cleanse foods of pathogens and thereby contribute to the health, longevity and reproductive success of people who find their flavors enjoyable.

(Billing, Jennifer, and Sherman, Paul W.; "Antimicrobial Functions of Spices: Why Some Like It Hot," Quarterly Review of Biology, 73:3, 1998)



Antibacterial properties of 30 spices.

STATISTICAL ASTROLOGY

No matter how severely scientists de- monize astrologers, statistics keep piling up suggesting that season-of-birth can influence human traits and talents. When one releets upon this matter, a rational, cause-and-effect Chain is not far out on the lunatic fringe. After all, a pregnant woman's body responda to varying temperatures, changing amounts of sunlight, seasonal foods, and varying physical activity during the year. Such effeets can be felt in útero, too.

Many of the multitudinous studies looking into the seasun-of-birth corre- lations are very specialized and employ small samples. For example, English pro- fessional soccer players in the 1991-1992 season were twice as likely to have been born September tlirough November. Mental traits are also influenced by season-of- birth. More medical students are born April through June than can be explained by chance. Best of all (for us) is the following correlation:

> Perhaps tbe most unusual seasonal effect is found amongst scientists who support revolutionary theories. It seems that academice who were quick to support controversial theories such as relativity and evolution tended to be born between October and April.

(Thomas, Jens; "Like a Virgo," New Scientist, p. 56, December 25, 1999) *1

Comment. So, there is a season for iconoclasts and anomalists! However, we (the editorial "we") bucked the trend. Could we have been born (unknowingly) in the Southern Hemisphere?

GENES VS. MEMES

Vital to the concept of "gene wars" (mentioned on p. 161) is the assumption that our destiny is controUed by "selfish genes" (or "selfish DNA"). The idea that evolution works only at the gene level has been ehampioned by R. Daw- kins, and today it dominates much evolution philosophy. However, this "genetic imperialism" is now being chaHenged by some scientists who insist that culture also affeets an organism's evolution, be it a human or an insect. In fact, it was Dawkins himself who first proposed the term "meme" for the cultural counterpart of the gene. A meme, in other words, is an "element" of culture that can be passed along to progeny by imitation and/or cultural pressures.

In reductionist thinking, environmen- tal chaUenges are met by gene mutations plus natural selection. In meme theory, the same challenges are confronted by cultural changes (meme "mutation") plus natural selection. The meme approach is holistic rather than reductionist and is appealing because it aHows us some control over our destiny.

There are severa! phenomena in whieh some scientists profess to see memes overpowering the genes:

(1)Generations of female infanticide have led to more male births than female births.

(2) In dairy-farming societies, 90% of the population has the enzyme lactase that aHows individuáis to digest cows' milk. In other societies, 80% become ül when drinking cows' milk.

(3)A variety of cultural pressures have raised the percentage of left- handers in North America to 12% compared with just 2% a century ago. In Taiwan, where cultural-pressures are quite different, only 1% of the populace is left-handed.

In the end, of course, neither genes ñor memes are in total control. Both genes and societies can be selfish!

(Spinney, Laura; "The Unselfish Gene," New Scientist, p. 28, October 25, 1997)

Comment. Surely, genes and memes are not all there is. We propose the word "xenes" for those evolutionary influences we haven't thought of yet. See also p. 312 for "evolvable hardware"!

ANOMALOUS TALENTS

Humans possess many remarkable talents verging on the anomalous, particularly in connection with seeing and hearing. In fact, our catalog Biological Anomalies: Humans I explores 25 categories of unusual human capabilities. However, during the period 1994-2004, we have found only three ítems worthy of inclusión in Science Frontiers. The pickings were slim, but what we did find is fascinating.

FROM THE SÜNSWEPT LAGOON

Mitchener fans will recognlze the above title as heading one of his chapters in Hawaii. Many Polynesian navigators did indeed set out from sunswept lagoons imo the superficially featureless Pacific. How did these peoples, a thousand years ago, sail reliably from one speek of land to another, thousands of miles distant? The archeology of Oceania con- firms that the Polynesians made sueh voyages centuries before they .learned about compasses and navigation satel- lites. But were these voyages anomalous; that is, did the Pacific peoples possess devices or talents unrecognized today by mainstream Science? For the most part, the answer seems to be NO.

While the navigational abilities of the Polynesian seafarers seemed supernatural to early European explorers, it has been convincingly demonstrated-----through modern voyages----that the senses of sight, hearing, smell, touch, and time-passage are and were sufficient for most inter-island voyages. The early Pacific navigators were adept at obser- ving the waves, stars, birds, clouds, winds, and severa! other natural pheno- mena that carry subtle directional cues. There are, however, modern instances in which Pacific navigators bereft of the usual sensory cues seem to employ an anomalous "sense."

B. Finney, in his study of the possi- bility of human magnetoreception, tells how one native Hawaiian navigator, though well-schooled in traditional Polynesian navigational techniques, con quered the dread doldrums on a 3,000- mile voyage from Hawaii to Tahiti in a way we might cali "psychic.".

In the doldrums, the sky is often overcast and the seas leaden, expunging the usual cues. This particular navigator, Nainoa Thompson, entered the doldrums on a black night, with 100% doud cover. The wind was switching around and the wayes cueless. Nainoa's own words were:

> It was like I just got so exhausted that I just backed up against the rail, and it was almost as if, and I don't know if this is completely true, but there was something that allowed me to understand where the direction was without seeing it. And it was almost like when I just gave up fighting to try to find something with my eyes. I just settled down and then all of a sudden it was like this warmth carne over me...When I sat back and leaned against the rail,
> I felt this warmth come over me and all of a sudden I knew where the moon was. But you couldn't see the moon it was so black, and then I directed the canoe with all this total confidence at a time when I had al- ready convinced myself prior to the voyage that I would have no confidence in knowing where to go. And I turned the canoe to this particular direction, got things lined up, felt very, very eomfortable in this coid, wet, rough environment and then there was a break in the clouds and the moon was there.

(Finney, Ben; "A Role for Magnetore-eeption in Human Navlgatíon," Current Anthropology, 36:500, 1995)

THROAT-SINGING

Humans are born with one organ that is capable of astonishing performances that greatly exceed what is required for the tracking of animáis and the grubbing of edible roots. This is the human brain, of course. Not as widely appreciated for its versatility is the human vocal tract. It can generate much more than brute grunts. It renders operatic arias of great beauty and fre- quency range. The vocal tract can do even more than that; it can carry two musical lines simultaneously. This skill is called "throat-singing" or "overtone-singing."

The best-known throat-singers live in the Tuva región of Southern Siberia. The semi-nomadic herders of this wild región were evidently inspired to de- velop throat-singing so that they could better mimic the sounds they heard in nature: the singing of birds, the wind, the sounds of insects.

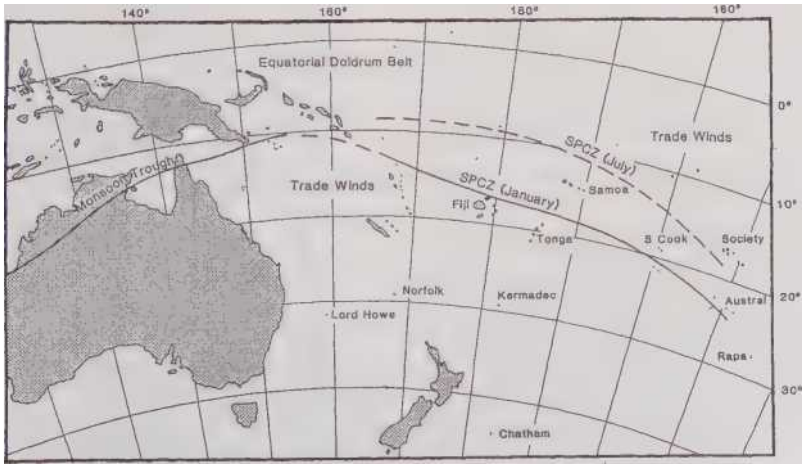
Throat-songs have two components. The first is at a low, sustained funda-mental pitch, which can be likened to the drone of a bagpipe. The second, superimposed on the low drone, is a suecession of flute-like sounds that resonates high above the drone. It is the second component that can be con- trolled so as to mirror natural sounds. The result is like nothing Mozart or Verdi conceived. But it is an art form valued in Tuva and a talent rather remarkable from a biologist's perspec- tive.

One should compare the vocal tract to an organ pipe with its standing waves, except that the human pipe is only 7 inches long in the average adult male. One end of the human pipe is the mouth; the other is at the so-called "vocal folds" deep in the throat (larynx). To control their "instrument" throat-singers move their tongues back and forth to change the standing waves in the vocal tract. The source of raw sound is the vocal folds. It is the vocal tract that shapes the raw sound into musical tones. Biofeedback is also involved as the throat-singers tweak the rate and manner in which the vocal folds open and cióse.

(Levin, Theodore C., and Edgerton, Michael E.; "The Throat Singers of Tuva," Scientific American, 281:80, September 1999) ■

Comments. The human throat is obvious-ly a complex musical instrument, but what survival valué does this remarkable instrument have? Did evolution overshoot its mark?

Incidentally, many birds can produce simultaneously two tones that are not harmonically related. However, these birds have a special double- barreled organ called the syrinx. So, the avian "two-voice" phenomenon is not as unexpected as it is in humans. But, waxing skeptical, as usual, we ask why some birds would need a two- voice capability when ducks, herons, and many other birds survive very well with rather crude vocalizations.



Ancíent Polynesian' navigators of the Pacific making the voyage from Hawaii to Tahiti, in the Society Islands, dreaded Crossing the doldrums near the Equator. Hawaii (not shown) is about 20° north of Tahiti. SPCZ = South Pacific Convergence Zone. (G. Irwin; The Prehistoric Exploration and Colonisation of the Pacific.

DO NOT TRY THIS EXPERIMENT AT HOME!

Our tolerance of heat is limited, and without enough drinking water, a single day is a hot desert is likely to end in a miserable death. But in 1775 the Secretary of the Royal Soeiety, Mr. Blagden, had a room heated to well above the boiling point, and, together with a dog and a piece of raw meat, he entered the room at 105°C. When he left it 15 minutes later, he and the dog were fine, but the steak was well done.

(S ehmidt-Nielsen, Knut; "At the Edges of Life," Nature, 407:132, 2000)

BODILY FUNCTIONS

Under "bodily functions[11] we usually inelude such phenomena as digestión, thermal control, and healing along with reproduction, death, and longe- vity, the latter being the prime foci in this volume. Unfortunately, we found little in the other areas of "function" during the past collecting period. Those interested in such topics should consult vol. 1 and our catalog Biological Anomalies: Humans II.

SEARCH-AND-DESTROY SPERM

Even book reviews can yield delightful anomalies. Take, for example, the Janu- ary Scientific American review of the book Human Sperm Competition, by R.R. Baker and M.A. Bellis. Baker and Bellis have advanced the Kamikaze-Sperm Hypothesis. (See vol. 1, p. 175) Central to this idea is the observation that the sperm of many animáis, including humans, are polymorphie. They come in a variety of shapes and sizes, some of which are patently unsuited for pene- trating an egg. Baker and Bellis draw upon their own studies and classifica- tions of sperm types as well as research by R.A. Beatty and D. Ralt. They assert that sperm come in at least four varieties:

•"Fertilizers," the egg-penetration specialists,

•"Blockers," the ones that construct copulatory plugs to prevent further in- semination,

•"Search-and destroy sperm" that hunt down as kill "enemy" sperm from other sources,

•"Family-planning sperm" that kill all sperm.

One can liken this array of sperm types to polymorphie ant colonies with their castes of workers, soldiers, and queen. Baker and Bellis go further and suggest that the numbers of each sperm type are under the control (certainly not conscious control! of the males. For example, where promiscuity is observed, as is common in chimpanzee troops, the numbers of seek-and-destroy sperm are very high.

All this out of a short review! Un- fortunately, the book itself lists at $78.95, and we don't have a copy.

(Sozou, Peter D.; "Mating Games," Sci- entific American, 274:102, January 1996)

Comments. Exercising self control, we add only two comments. First, these specialized sperm cannot be as simple as those drawn in the biology books. The search-and-destroy type must have evolved biochemical "devices" that find, identify, and destroy other sperm and maybe even defend itself. Second, one should not ignore the eggs, which are much larger and likely more sophisti- cated. The receptivity of the eggs may be influenced (perhaps not unconscious- ly) by the female.

COUVADE CHEMISTRY

Medical history records numerous instances where the husband of a pregnant woman exhibits some of the symptoms of pregnaney, such as mor- ning sickness. This sympathetic reaction is called the "couvade." This phenomenon can be partially explained biochemically, but psychosomatic factors are obviously involved.

Researchers find that a father-to-be's estrogen (female hormone) levels rise markedly—even exceeding that of his wife- - -as the time-of-delivery approaches. Interestingly, the father's testosterone levels are also elevated prior to birth but fall immediately afterward. As the wife's day-of-delivery approaches, the levels of prolactin, which plays a key role in breast-feeding, increase in both husband and wife.

(Rubin, Rita; "Dads Get 'Nurturing' Hormones after Birth," Chicago Sun- Times, June 20, 2000. Cr. J. Cieciel)

Comment. Male lactation, which is rare in humans, is probably associated with this increased production of prolactin. Male lactation is also known in other mammals, such as fruit bats. (See p. 122)

The mind is driving all of these Chemical changes in the father-to-be. The question is HOW? And, maybe WHY?

BROTHERLY LOVE

We quote in its entirety a Reuters item from Cairo. WARNING: this item is rated. D, for Disgusting.

An Egyptian teenager who complained of stomach pains had his underde- veloped twin foetus lodged above his abdomen, where it had been slowly feeding off him for the past 16 years, medical sources said. Doctors found a 4-lb 6-oz foetus with a head, arm, tongue and fully formed teeth when they operated on Hisham Ragab, 16. Incompleta ovum división is not un- common, but this was the most de- veloped such foetus found in Egypt.

(Anonymous; London Times, July 3, 1997. Cr. A.C.A. Sük)

LIVER DEL1VERY

In May 2003, a healthy human baby was born in South Africa after développing upon its mother's liver rather than in her womb.

(Anonymous; New Seientist, p. 11, May 31, 2003.)

THE UNIQUENESS OF HUMAN ADOLESCENCE

What major biological characteristics sepárate humans from other animáis?
The usual list begins with our large brain and bipedality, but these features are shared with dolphins and birds, re- spectively. Even our peculiar repro- ductive biology (permanent breasts, con- tinuous sexual receptivity of both sexes, etc.) no longer seem so unique, particularly after reading about the antics of the bonobos (pygmy chimps)! But wait! No other animal, even the other primates, go through adolescence. That time period between puberty and the actainment of adult stature turns out to be something uniquely human.
The great puzzle of adolescence, ac- cording to B. Bogin, is its evolutionary origin. What possible advantage does adolescence confer on humans in the battle for survival? To the contrary, skipping the teens would appear to be an advantage in the survivability of parents! One guess is that adolescence —all 8 or so years of it---------is required for the development of the complex social skills needed by adults.

(Bogin, Barry; "Why Must I Be a Teenager at All?" New Seientist, p. 34, March 6, 1993)

CIRCASEPTENNLAL RHYTHM IN EAR GROWTH

J. V erhulst and P. Onghena have care- fully measured the ears of a sample of British men aged from 30 to 83 years. Every seven years, they discovered, the rate of ear growth peaked. In this finding, Verhulst and Onghena supported the contention of the Ancient Greeks ■ that tliere is a seven-year rhythm in human development.

(Anonymous; "Rhythmic Ear Growth...," Science News. 151:26, 1997. If you are skeptical about this ítem, the source cited is: British Medical Journal, Decem- ber 21/28", 1996)

Cross reference. We also record rhythmic growth spurts in children in vol. 1, p. 122.

SOLAR ACTIVITY, YOUR MOTHER'S BIRTH YEAR, AND YOUR LONGEV1TY

> According to two scientists who stum- bled on a startling statistical associa- tion----though not necessarily a cause- effect relationship-----your life span may depend on the number of sun- spots that appeared in the year your mother was born.
>
> They found that if the sun was at a máximum in its 11-year cycle (during whieh the number of sun- spots rises and falls), children of mothers born at that time would die an average of two to three years sooner than if their mothers had been born during the sunspot mínimum.

Before dismissing this fascinating cor- relation as "nut Science," consider that the study was conducted by two estab- lished scientists at Michigan State Uni- versity, B. Rosenberg and D.A. Juekett. Their report was published in the March 1993 issue of the mainstreám journal Radiation Research. Furthermore, in two English studies of longevity. the same periodicity was remarked. Although the population sample in the Michigan State work was small (7552), the phenomenon appears sufficiently robust to admit to the columna of Science Frontiers! (In truth, we covet bizarreness as much as robustness!)

But what possible causal link might eonnect one's longevity with one's mother's date of birth? Rosenberg and Juekett point to the fací that when a woman is born all of her eggs are al- ready formed. Later, they will mature and be released one at a time (usually). Therefore, if solar radiation levels (proportional to sunspot numbers) are high near her time of birth, her entire inventory of eggs will be bombarded by high levels of solar radiation. The en- suing damage might show up as shor- tened lifetimes for her children.

(Rensberger, Boyce; "An Extraterres- trial Link, Sunspots and Life Span," Washington Post, p. A3, May 24, 1993. Cr, J. Judge and D. Swaner)

LONGEVITY AND SARDINIA

If you were not born in the fall (see above Ítem) and thereby received a few months' bonus in longevity, you might compénsate for the loss by moving to sunny Sardinia in the Mediterranean. Nowhere else on the planet does a larger proportion of the male population live to the century mark. Strangely, female longevity is unaffected by whatever it is that produces the male Methuselahs.

We have, therefore, two questions to answer: (1) Why do so many males reach the 100-year mark; and (2) Why are Sardinia's women short-changed?

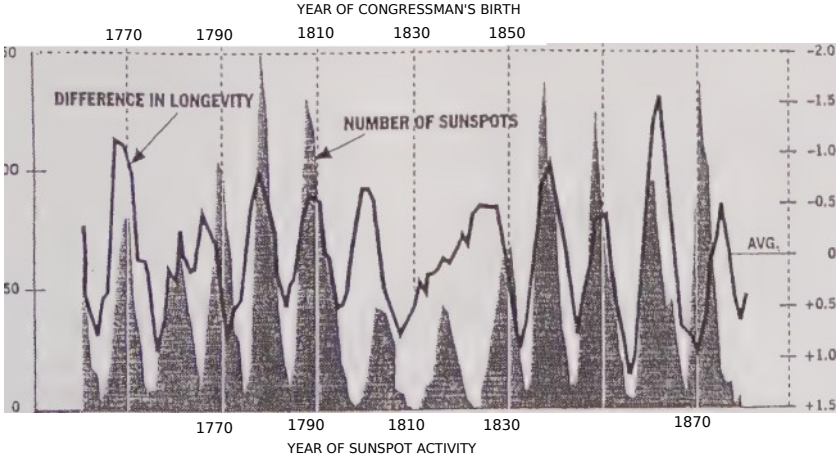
No one has good answers. It might be genetic (an inbreeding effect) or simply lifestyle (more imbibing of the island's red wine).

(Koenig, Robert; "Sardinia's Mysterious Male Methuselahs," Science, 291:2074, 2001)

FALL BABIES LIVE LONGER

Not by much, just a few months longer, but enough to look for a reason. In Austria, babies born October-December live about 0.6 year longer than those who first see the world April-June. The same effect emerges in Denmark, but the fall advantage is only 0.3 year. Don't bother looking for an astrological expla- nation. The longevity enhaneement may just be the consequence of more fruits and vegetables being available to preg- nant women in the months preceding birth.

(Anonymous; "Study: Babies Born in Fall Live Longer," Scranton Tribune, February 27, 2001. Cr. M. Piechota)



Correlation of Congressman longevity and sunspots. The left ordinate is the sunspot number; the right is the difference in life span. Note that the birth-year scale is shifted 20 years to the left, the pre- sumed age of the mother at the time of the Congressman[1] s birth.

SYN CHRONICITY AND DEATH

In our catalog Biological Anomalies: Humans II, we catalog several cases where identical twins have died almost simultaneously. We now add the following to that collection:

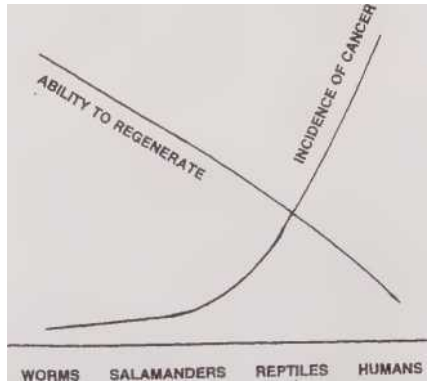
> Identical twins John and William Bloomfleld lived their entire 61 years together in Australia and died only minutes apart, on Sunday. Both John and William suffered heart attacks.

(Anonymous; "Twins Die," Saginaw New;., May 22, 1996. Cr. B. Kingsley via COUD-I)

LIFE'S LETHAL QUALITY CONTROL

Cáncer is such a deadly scourge of life that one wonders why it was not strongly selected against and totally eliminated from all forms of life long ago. Does cancer's eons-long persistence among a wide spectrum of living things imply that it has some purpose—some positive valué that we are blind to?

Back in 1983, in vol. 1, p. 117, we observed that the incidence of cáncer is strongly correlated with the complexity of organisms. It would seem therefore that cáncer tends to damp out any tendeney Ufe has (or is given) to attain higher states of diversity and complexity. Some even hold that cáncer is the price that must be paid by higher forms of Ufe!



As the biological complexity of an organism increases, its susceptibility to cáncer rises and its ability to re- genérate tissue decreases. (From our catalog Humans 11)

But there is much more to be said about the potential roles of cáncer in the development of human Ufe.

It must be recognized that the bulk of human cancers occur in individuáis beyond the age of reproduction. If old- age cáncer has an evolutionary purpose, it might be simply the reduction of the drain nonproducing oldsters place upon society.

One can also speculate as do A. Leroi and J. Graham that cáncer is one of evolution's methods of quaUty control. To be effective in this role, cáncer must affect individuáis capable of reproduction —before they reproduce. However, there are only a few lethal childhood

cancera speeifically aesociated with additions to human biological diversity. Two such examples are: brain cáncer and bone cáncer.

These are interesting observations, but they alone can hardly account for the strong correlation between cáncer incidence and complexity.

J. Graham goes much further In his 1992 book Cáncer Selection. There, he claims that cáncer is the driving forcé in the creation of biological diversity.
In other words, living things tend to evolve features that reduce the incidence of cáncer. One of the examples Graham proposes is the evolution of shells by snails to protect themselves from cancer-inducing solar ultraviolet light. His book contabas many more examples.

(Watts, Geoff; "Life's Lethal Quality Control," The Times Higher Education Supplement, April 11, 2003. Cr. J. Graham.

Comment. Since cáncer has survived the flltering aetion of natural selection for hundreds of millions of years and attacks so many organs in so many diverse speeies, we wonder if it has a single, simplistie explanation.

ORGANS

In volume 1, the focus of our collection of organic anomalies and curiosjties was the human brain. In contrast, this volume's collection is more diverse.

•Brain. Information capacity, location of music processing.

•Eyes. Underwater visión, evolution of human spectral response, and resetting circadian docks.

•Ears. Our ears generate sound. Why?

•Nose. Pheromone detection.

•Heart. It isn't always where it should be!

BRAIN

OTHER BIG BRAINS

In the widely accepted view of human evolution, creatures in the genus Homo were blessed with a sudden increase in brain capacity circa 2 million years ago. This size increase supposedly gave our distant ancestors the extra intelligence they needed to outperform competing, contemporary hominids, such as Paranthropus and Australopithecus. Logical thinking, of course, but paleoanthropologist S. Elton (University of Kent) and colleagues have found that the skulls of Paranthropus in the period 1.6-2.5 milhon years ago also underwent a size increase equal to and possibly greater than the 20-25% volume increase in the Homo skulls.

This supposedly random mutation is particularly interesting because it occurred about the same time in two hominid lineages but not in Autralopithi- cus and other hominids then in competi- tion. Skulls of primates in the genus Theropithecus, the ancestors of modern monkeys, don't show this sudden volume increase either. This was a repeating but very selective mutation—if that is what it was.

(Ainsworth, Claire; "We Weren't the Only Ones to Get a big Head," New Scientist, p. 11, June 3.0, 2001.)

Comments. Curiously, the brain expansión in Paranthropus did not save it from oblivion, yet the monkeys have done very well with the bigger brains.

HUMAN DNA INFORMATION CONTENT INSUFFICIENT

The connections between the nerve cells comprising the human brain represent much more information than can possibly be encoded in human DNA.

(Cohén, Jack, and Stewart, Ian¡ "Our Genes Aren't Us," Discover, 15:78, April 1994)

Comment. If "genes aren't us" the bil- liondollar human genome project cannot fulfíll its promises.

MUSIC OF THE HEMISPHERES

The playing and composition of music has always been considered the near- exclusive province of the brain's right hemisphere. This turns out to be far from the truth. For example, non- musicians use both hemispheres in musical matters; the right side for recog- nizing melody and intonation, the left for such analytical matters as rjiythm and notation. However, professional musicians, as their brain waves demón- strate, use their left hemispheres for just about everything of a musical nature. So much for the right-hemi- sphere theory!

The comparison of magnetic resonance images of 27 right-handed musicians and 27 right-handed nonmusicians have shown that even their brain structures
differ. The corpus callosum-------that inter-hemisphere information highway----- is 10-15% thicker in musicians who began their training while young than it is in nonmusicians. Our brain structure is apparently strongly molded by early training. The corpus callosum in musicians is essential in such things as finger coordination. Like a weight-lifter's biceps, it enlarges to accommodate the increased tasks assigned to it.

(Anonymous; "Music of the Hemispheres," Discover, 15:15, March 1994)

Comment. It would be interesting to compare the brain structures of mathematicians and nonmathematicians where the dexterity factor is absent.

EYES

THE EYES HAVE IT

Small nomadie tribes called "sea gypsies" have lived for centuries among the islands of Southeast Asia. The children of these tribes regularly dive to eollect clams, sea urchins, and other food Ítems from the ocean bottom. These children are famous for their aquatic skills. Research has dis- covered that they also have better-than-
normal underwater visión-----twice as good as Europeans.

Tests reveal that while diving, the sea gypsies routinely, involuntarily con- strict their pupils and change their visual focus (accomodation) in ways to better find their culinary targets. Some fraction of these adaptations is doubtless acquired through use, but some suggest that, over centuries of diving for food, genetic vari- ations have further improved the abnor- mally acute underwater visión of these children.

(Travis, J.; "Gypsy Secret," Science News, 163:308, 2003)

Comment. From the above it is unclear whether microevolution has occurred in the sea gypsies. The point is that their eyes Bomehow adapted to an environmental challenge. More interesting in this re- spect is the human eye's apparently "perfect" adaptation to the solar spectrum

It is sometimes said that humane see best at yellow-green wavelengths be- cause they have evolved under a Sun whose blackbody spectrum has a Wein Peak in the green part of the spectrum. However, as a function of frequency, the solar blackbody spectrum peaks in the infrared. Why did human visión not evolve toward a peak sensitivity in this range, if the eye is an effici- ent quantum detector of photons? The puzzle is resolved if we assume that natural selection acted in such a way as to maximize the amount of energy detected by the retina across a range of wavelengths (whose upper and lower limits are fixed by biological con- straints). It is then found that our eyes are indeed perfectly adapted to life under a class G2 star.

(Overduin, James M.; "Eyesight and the Solar Wein Peak," American Journal of Physics, 71:216, 2003)

Comment. Human eyes, then, evolved to maximize energy intercepted under a class G2 star. It is curious, then, that humans and other primates have triehro- matic eyes (cones for three colors) while most other mammals, which have longer evolutionary histories under our class G2 star, are merely bichromatic. And birds have flve different color-sensitive cones. Apparently these other creatures are not as "perfectly adapted" as we are!

CAN HUMAN KNEES SEE?

Well, maybe, sort of, and then only the backs of the knees. It is claimed that human circadian docks can be shifted by shining visible light on the skin on the backs of the knees. It is theorized that the light penetrates the skin and causes Chemical changes in the blood, implying that human blood contatos "chronobiologi- cal photoreceptors."

Human circadian clocks can be reset by light through the eyes or, it has been claimed, by light penetrating the skin in back of the knees.

(Oren, Dan A., and Terman, Michael; "Tweaking the Human Circadian Clock with Light," Science, 279:333, 1998.
Also: Campbell, Scott S., and Murphy, Patricia J.; "Extraocular Circadian Phototransduction to Humans," Science, 279:396, 1998) ----------

Comment. We can see how the tomatoes and beetles might find exotic photoreceptors useful, but what environmental pressures would favor the evolution of photoreceptors in the human blood?

But, read on!

LIGHT MARES BRIGHT

As revealed above, the backs of our knees may be unexpectedly sensitive to light. Illumination of these regions some- how seems to encourage our pineal glands to release melatonin. D. Jones has suggested a more direct way to which light can reach the pineal gland through our ears!

The pineal gland, which is believed to be the relie of the third eye that our distant reptilian ancestors possessed, is now buried deeply to our bratos. But, it is possible that light could reach it through the ears by diffusing through the soft, translucent tissues that lead toto our skulls. A commercial opportun- ity arises here.

Jones notes fírst that melatonin is a mood enhancer and stimulant. We all have read how depressed far-northern peoples become during their long winter nights; and we know first-hand how exuberant we are on bright spring days. Why not, asks Jones, manufacture "ear- lights" mounted on headbands? These would direct red light (which diffuses better through tissue) into the ears and thence to the pineal gland. People could thereby be made chéerful and enthusias- tic whatever the season, weather, or time of day. We could dispense with all those mood-enhancing pills.

(Jones, David; "The Seeing Ear," Nature, 391:541, 1998)

KNEE LIGHT NOT EFFECTIVE?

Above, we described an experiment that seemed to show that shining light on the backs of one's knees could alter or reset one's sleep-wake cycle. A similar experiment has not confirmed the results re- ported earlier. It is noted in the refer- ence below that the original experiment would be more credible if there were a recognized mechanism that could carry signáis from the knee to the brain.

(Barinaga, Marcia; "Setting the Human Clock: Technique Challenged," Science, 297:505, 2002)

EARS

MORE HEAR EARS

On p. 123, you will find a digest of an article describing the sounds heard ema- nating from the ears of horses. another report on sound emissions from mam- malian ears has appeared in Nature. Although the body of the article deais with sounds emanating from the ears of chinchillas, humans are not neglected. First, from the abstract:

> The inner ear sometimes acts as a robust sound generator, continuous- ly broadeasting sounds (spontaneous otoacoustic emissions) which can be intense enough to be heard by other individuáis standing nearby. Para- doxically, most. individuáis are un- aware of the sounds generated within their ears.

Second, the article's final sentence is perttoent here:

> Apparently, some humans with intense spontaneous emissions owe their hearing loss to internal 'noise' which they are unable to perceive.

(Powers, Nicholas L., et al; "Elevation of Auditory Thresholds by Spontaneous Cochlear Oscillations," Nature, 375:585, 1995)

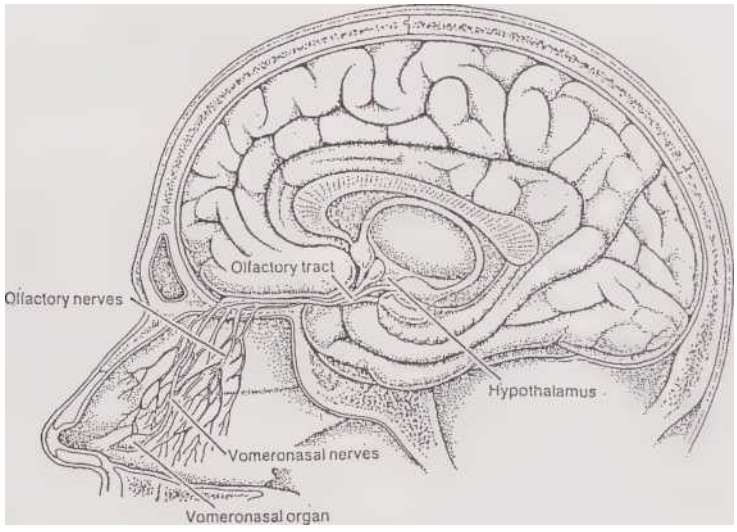
NOSE

A TALE OF TWO NOSES

First: An Anecdote. Some 30 years ago, D. Berliner, at the University of Utah, was studying human skin. To acquire raw material, he scraped skin cells from the insides of casts discarded by skiiers who had had broken bones. From this debris, Berliner extracted numerous Chemical compounds. As far as anyone could tell, these substances were odor- less, so he stored them to open flasks. However, Berliner noticed that when people were working in the lab with the flasks, they were more friendly and re- laxed than normal. He could not divine the reason until some months later when he decided to cover the flasks of skin- derived substances. Curiously, the lab workers soon reverted to their usual grumpy selves! What could account for this strange behavior change? Knowing that animáis often communicated with one another employing Chemicals called phero- mones, Berliner suspected that the flasks had been releasing odorless human pheromones. Sure enough, analysis of the skin-derived materials proved him correct.

Next: A Look Up the Nose. Biologists have long realized that animal noses actually contato two sensory channels. The first is the familiar olfactory System, which humans also possess. The

second channel is the vomeronasal System. In animáis, each system has its own sepárate organs, nerves, and bumps in the brain. The function of the vomeronasal system is pheromone detection. It was widely believed that humans had long ago disearded this sensory system along evolution's trail. But a closer look at the human nose by B. Jafek and D. Moran, affiliated with the Rocky Moun- tain Taste and Smell Center at the Uni- versity of Colorado, revealed that all humans examined displayed two tiny pits on both sides of the septum, just inside the the opening of the nose. Be- hind the holes were tubes lined with unique cells that could well be pheromone deteetors, since they responded positively to puffs of air laden with pheromones.



The vomeronasal and olfactory sensory Systems. (L. Stansass, M. Reingold)

In conclusión, we humans aetually do have a sixth sense, and we are all enveloped in an aura-----not the luminous aura of the mystics but a cloud of pheromones. Somehow, our attitudes towards others are likely affected by these pheromones.

(Blakeslee, Sandra; "Human Nose May Hold an Additional Orgán for a Real Sixth Sense," New York Times, Septem- ber 7, 1993. Cr. P. Gunkel)

HEART

DEAD SHOT MISSES TARGET AND UVES

September 21, 1927, Sandy Hook, KY.

W. Gray attempted suicide by shooting himself in the heart. His aím was good, but he survived. His heart, it turned out, was on his right side rather than his left.

(Anonymous; "Heart on Wrong Side Foils Man's Attempt at Suicide," New York Times, September 22, 1927. Cr. M. Piechota)

Comment. The reversal of internal organs is termed "situs inversus vis- cerum." See our catalog Biológica! Anom- alies: Humans I for "mirror-image twins."

ORGAN MÜSIC

Your doctor is understandably concerned if he finds your heartbeat is irregular. But it turas out that the healthy heart does not beat steadily and precisely

like a metronome. In fact, the intervals between normal heartbeats vary in a curious fashion: in a simple, direct way, they can be converted to musical notes. When these notes (derived from heartbeat intervals) are heard, the sound is pleasant and intriguing to the ear—
almost music---and certainly far from being random noise. In fact, a new CD entitled: Heartsongs: Musical Mappings of the Heartbeat, by Z. Davis, records the "music" derived from the digital tape recordings of the heartbeats of 15 people. Recording venue: Harvard Medical School's Beth Israel Hospital!

This whole business raises some "interesting" speculations for R.M. May.

> **We could equally have ended up with boring sameness, or even dissonant jangle. The authors speculate that musical composition may involve, to some degree, "the recreation by the mind of the body's own naturally complex rhythms and frequencies. Perhaps what the ear and the brain perceive as pleasing or interesting are variations in pitch that resonate with or replícate the body's own complex (fractal) variability and scaling."**

(May, Robert M.; "Now That's What You Cali Chamber Music," Nature, 381:659, 1996)

INTERNAL SYSTEMS

WE ARE ONLY 10% HUMAN!

The average human body eontains 100 trillion cells, but only 1 in 10 of these ceUs is your own. The remaining 90% are bacteria. These alien organisms coat your skin and pave your inner passageways from mouth to anus. Of course they are much smaller than your own ceHs, so what you see is mostly you. Even so, you are a composite creature and cannot survive without these tiny hitchhikers and symbionts. ,

Just as in the oceans, our bodies are battlegrounds. Each day we are thrice invaded by massive new armies of bacteria present our food. Water and air, too, bring more combatants into the fray. Our resident bacteria continuaUy fend off the invaders or accommodate them. Some are pathogenic and must be killed; others are useful in many ways, as in digestión.

Who's reaHy in charge in our bodies: the 90 trillion bacteria or the 10 trilhon cells we cali our own? Probably, neither!

(Hamilton, Garry; "Insider Trading," New Scientist, p. 42, June 26, 1999)

Comment. We hear a lot about "selfish" genes and "selfish" DNA, and that we humans exist only to further the goals of DNA----whatever they might be. But are not aR these living bacteria and non-living viruses also "selfish" at different levels of complexity? Humans may be at the top of the food chain, but are we really in charge?

WHO'S IN CHARGE DOWN THERE?

A microscopic ecosystem thrives in your intestines. This menagerie of tiny organisms boasts more than 400 species of bacteria. Not aH of these bacteria are contení to wait around until we eat some- thing that they like. Molecular biologist P. Falk and colleagues discovered that some of the bacteria inhabiting the intestines of mice send Chemical direc- tives to the mouse's intestinal cells, causing them to synthesize those sugars the bacteria require. Since the bacteria that make a living in the intestines of mice are very similar to those in humans, the same phenomenon is probably occurring in your innards as you read this.

(Anonymous; "Bac Talk," Discover, 18:23. February 1997)

Comments. There doesn't seem to be much you can do about your presump- tuous intestinal bacteria. Maalox won't dissuade them.

Even though we are infected with bossy bacteria and bend to the commands of "selfish genes", we still imagine we possess free will!

THE MIDI-CHLORIANS ARE WITH US!

Whoops! We meant to write "mitochon- dria" in that title.

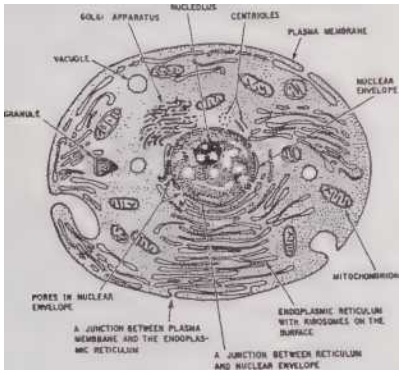
In the movie Star Wars, Episode 1: The Phantom Menace, Jedl master Qui-Gon Jinn explains the origin of the supernatural powers possessed by Jedi knights. It arises, he says, from microscopio lifeforms called "midi-chlorians" that dwell within all living eells and reveal the will of the Forcé.

Mitochondria are popularly seen as mere powerhouses within eells, with little influence on the organistas they inhabit. They are, it is believed, just the distant progeny of bacteria that invaded complex ceUs hundreds of miUions of years ago. With only 37 genes in their arsenal, human mitochondria would not seem to pose any threat to humanity. After all, we have about 100,000 genes per cell. Of course, mitochondria do evolve sepa- rately from us, and this is a bit dis- concerting. Could they be more than mere symbionts?

The midi-chlorians of the Jedi knights were "good guys", but our mitochondria sometimes seem to be working for an insidious alien Forcé. There is good evidence that they:

- **Selected which of your mother's germ eells matured to produce you;**
- **Have decided your odds of living to be 100; and - —**
- **May influence your being afflicted with Parkinson's and Alzheimer's, as well as rarer disoders.**

The first Ítem (or "forcé") is the most disturbing. Mitochondria (with only 35 genes), it seems, can exercise vetoes over decisions by our own genome (with its 100,000+ genes).



The eells of "higher" organisms (like us) are busy places. One of this cell's mitochondria is shown at the lower right, but there are also severál others tn the sketch. Incidentally, mitochondria have their own DNA and sepárate evolutionary histories.

(Cohén, Philip; "The Forcé," New Scientist, p. 30, February 26, 2000)

Comment. It je disconcerting to realize that within each of our eells hundreds of alien entities, though helpfully sup- plying energy, are mutating and evol- ving in ways to enhanee their fltness rather than ours. Like so many true parasites, mitochondria will not shrink from modifying their hosts (us!) to achieve their ends—whatever they are. The Forcé seems to be with them!

MIXED-UP PEOPLE

Mother-child chimeras. Investigators have discovered eells carrying male DNA among a mother's blood eells 27 years after the birth a male child. Evidently, descendente of fetal eells escape during pregnaney and persist in the mother for years after birth. The mother thus be- comes a blend of herself and her child (or, possibly, children)—a kind of chimera.

The question is: Why doesn't the mother's immune system destroy these foreign eells? Some scientists speculate that these escaped and still-surviving eells may help explain why women are more susceptible than men to autoimmune diseases.

(Travis, J.; "Kids: Getting under Mom's Skin for Decades," Science News, 149: 85, 1996)

Fatherless blood. In Britain, a male child has been found with normal skin, with each cell carrying the expected X and Y ehromosomes, but "his" blood is all female. Its eells contain the mother's two X ehromosomes with no paternal con- tribution. What happened? One theory is that the mother's unfertilized egg spontaneously divided. Then, fertiliza- tion occurred, but it was only partial.
The sperm got to just one of the two or more eells derived from the egg. The embryo continued to develop but it was part all-mother and part mother-father! "Partial parthenogenesis" seems to be the proper term here.

The affected "boy" also has noticeably asymmetrical facial features. Since one in every few hundred people display slight facial asymmetry, partial parthenogenesis may be more common than usually thought.

(Cohén, Philip; "The Boy Whose Blood Has No Father," New Scientist, p. 16, October 7, 1995)

WOMEN'S BARR BODIES

Women are biologically more complex than men. After all, they must eyele through sexual, pregnant, and nurturing states.
In aetuality, female complexity goes far deeper than these easily observed macro-scopic states. Women are mosaics, men are not. Women are mixtures of two different cell types. This mixture often leads to medical problema, such as autoimmune diseases, and the curious fact that identi- cal twin girls are generally less identical than identical twin boys.

The root of these problema is the X-chromosome: women have two of them, one from mom and another from dad. Men, oh the other hand, manage well with just one plus that puny Y-chromosome that does little except confer masculinity. In con- trast the large X-chromosome packs about 5% of a human's genetic instructions. For some unknown reason, female eells find that two X-chromosomes are too much to cope with. The eells consequently turn one of them off, and these turn into puzzling little "nuggets" inside each female cell called "Barr bodies." (Male eells never endose Barr bodies.)

The surviving X-chromosome in a female cell may be either from the father or the mother, thereby creating that mixture of two kinds of eells in females. In a word, females are mosaics. And mosaicista can lead to more medical problema than those simpler, one-X-chromosome males face.

(Bainbridge, David; "The Double Life of Women," New Scientist, p. 42, May 10, 2003)

Comment ■ Compounding female complexity is the occasional leakage of blood eells from the fetus across the placenta into the mother's blood stream. Mothers thus may become "blood chimeras" with more than one type of blood cell.

THE ULTIMATE IN UNISEX

At the Western General Hospital in Edin-burgh, doctors have been examining a "boy"' with an ovary and a fallopian tube instead of a left testicle. Part of "his" body's eells are male (one X and one Y chromosome), part female (two X ehromo-somes) . This hermaphrodite-like condition apparently developed because "he" was conceived via in vitro (IVF) fertilization. Probably both a male embryo and a female embryo were transferred to "his" mother's uterus, where they fused and formed a single fetus.

(Anonyraous; "Two into One," New Sci-entist , p. 21, January 24, 1998. Cited source: The New England Journal of Medicine, 338:166, 1997.)

Comments. We have already cataloged two similar conditions:

(1) , Human blood-chimeras, where one person has two types of blood due to the absorption of one fetus by its twin, each having different blood types. (In Biological Anomalies: Humans II)

(2) Birds that are female on one side and male on the other (bilateral gynan-dromorphism). (In our catalog Biological Anomalies: Birds)

TWO POLITICALLY INCORRECT BIOCHEMICAL ANOMALIES

Whether one views it as females at-tacking males or as a biological favor-itism toward men, the fact is that men's bodies accept donor organs from women while women's bodies reject organs from men. Scientists speculated that a male-speciflc antigen—a protein that exists in all eells of a man's body, but in none of a woman's—causes this incompati- bility.

(Seachrist, L.' "Finding the Gene for Female Attack," Science News, 148:132, 1995)

Comment. Even so, females obviously do not reject male embryos. For more, see "The Enigma of the Fetal Graft" in our Biological Anomalies: Humans II.)

Next, a rather amusing question posed by a reader of New Scientist.

> **It is well-known that if a bitch urinates on your lawn, you'll get a brown circle of dead grass, whereas a dog's uriñe does no visible harm. What is the Chemical involved and why do only bitches excrete it?**
> **Does the same apply to the male and female of other animáis (including humans)?**

(Wylie, Andrew; "Wee Problem," New Scientist, p. 89, August 5, 1995)

A "HUMAN ECHO"

The December 15, 1935, issue of the New York Times carried the following Associated Press dispatch.

> **The mystery of 7-year-old Frank Atkinson, who "vibrates" when he sleeps and whose body produces strange "knockings," has been solved — in principie at least.**
> **Through some unknown physiological process, doctors said they had determined, the boy, while asleep, becomes a "human echo" and reproduces a noise created anywhere near him.**
>
> **"When anyone taps on the wall," the doctor reported, "there is a sound from Frank's abdomen. I do not know whether the noise comes from the stomach or the intestines.**
> **The number of noises produced al~ ways corresponda with the knocks on the wall.**
> **"The whole thing is uncanny. I found that there was no reaction if 1 held part of the boy's body. I tap- ped four times near him while holding his hand. I released the hand and tapped another four times. Frank produced eight noises.**
> **"When he makes these noises, his whole body and the bed he is lying on shakes with vibration."**
> **Loud and soft knocks were reproduced with equal fidelity. The policemen were on watch to see that no one else in the house could manage to repeat the knocks.**

(Anonymous; "7-Year-Old Boy Vibrates While Asleep; British Physicians Cali Him 'Human Echo,"[1] New York Times, December 15, 1935. Cr. M. Piechota)

Comments. Apparently unrelated are the minute vibrations that afflict all human bodies continuously. These fall in the 6-12 Hertz range. See: Biological Anom alies: Humans 1)

ARE WE RUNNING ON MARTIAN TIME?

It is really very curious. In the absence of aH external time cues, the human body slowly shifts its internal dock from earth time (24-hour days) to Martian time (24.9-hour days). Could we aH have been Martians in the deep, distant past? This thought was triggered by the recent surmises that earth life might have originated on Mars and been brought here by an immigrant meteorite.

(Packard, Gabriel; "Martian Day," New Scientist, p. 54, October 10, 1998)

HEALTH

~~Since the pages of Science Frontiers aim at highlighting the major controversies and anomalies of science. It is not surprising to find several Items in this "health" section devoted to cáncer and epidemics. Both of these biological phenomena are complex and poorly understood. They are therefore given speeial attention here.~~

~~•Cáncer. Its possible evolutionary origin and, especially, ¡ts subversive and insidious nature.~~

~~•Epidemics. The real nature of the "Black Death," etc.~~

~~«Stroke. A curious geographical concentration of this malady in North America.~~

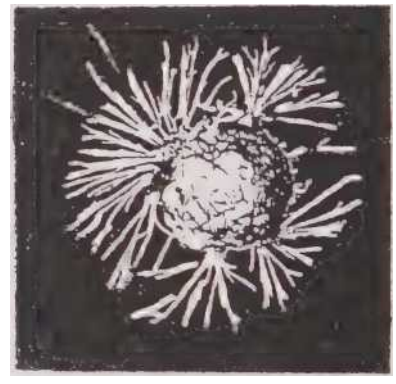
~~•Cures. The efficacy of homeopathy remains controversia!.~~

CANCER

TRAITORS WITHIN

One of the insidious talents of cancers is their ability to coax neighboring, normal tissue to do their bidding. What cáncer ceHs need most, if they are to grow, is sustenance, as normally pro- vided by blood vessels. Obligingly, even though it could lead to their own demise, the tissues surrounding the cáncer wül grow new blood vessels to supply the küler in their midst.

It has now been discovered that some particularly aggressive cancers, some melanomas, for example, can grow without the help of nearby subverted tissue. They can manufacture their own blood vessels which carry nourishment to malignant ceUs deep in the cancers. These self-made blood vessels differ from normal vessels in their lack of endothelial ceHs. They are also organized in distinctive patterns of loops around clusters of cáncer ceHs. Normal blood vessels tend to be ar- ranged more randomly



A cáncer cell "reaching aut" for blood supplies.

Although they origínate in specia- üzed tissues, such as the prostate gland, the ceHs in aggressive cancers become unspecialized. In a sense, they revert to embryonic ceHs that can then become any kind of cell, such as those in blood vessels. Cáncer ceHs are atavistic throwbacks to the womb.

(Barinaga, Marcia; "New Type of Blood Vessel Found in Tumors," Science, 285: 1475, 1999. Spinney, Laura; "Organized Killers," New Scientist, D. 11. Seutem- ber 11, 1999)

Comment. It's aU very insidious-------Uke some alien entity from the pages of science fiction with its own agenda that aims to take over one's body. But the infected body dies before the transfor- mation is complete. One has to wonder how these seemingly autonomous cáncer ceHs with such dever tricks ever evolved when they always die along with their victima. There's no feedback!

SDBVERSIVE CANCER CELLS

It has been generally believed that most cancers origínate in a single founder cell, which then nrnltiplies to create the tumor. But cáncer is more insidious than expected. A precancerous founder cell may actually subvert nearby noncancerous cells and turn them into cancerous cells.
In this sense, the first precancerous cell recruits and transforms healthy cells, enlisting them in its destructive opera- tions, and thereby turning them against the body that produced them. No one yet knows how this subversión is effected or how it evolved. (Why is there cáncer anyway?)

The basis for this claim involves a few rare human mosaics, whose bodies are built of cells with two different genetic complements. Cancers in human mosaics have been found to contain both types of cells and, therefore, did not grow from a single cell alone.

(Day, Michael; "Cancer's Many Points of Departure," New Scientist, p. 16, June 1, 1996)

CommentB ■ Curiously, some "primitive" animáis, such as sharks, seem to have evolved defenses against cáncer that mammals lack. With reference to "mosaics," see Ítem p. 111 on "Mixed-Up People."
Also relevant is "The Insidious' Pro- perties of Cáncer Metastases" in our catalog Biological Anomalies: Humans II.

CANCER: A PRECAMBRIAN LEGACY?

Throughout much of Precambrian time until the onset of the Cambrian period some 540 million years ago, single-cell organisms dominated the planet. The goal of each individual cell was to pros- per and proliferate. Competition with other cells, including those of the same species, was intense. Altruisra did nct exist. The most successful species were those that were tough and aggressive. Nevertheless, as the Cambrian began, some single cells suppressed their mutual antagonisms and formed partner- ships. Thus were born the first meta-zoans----the multicellular species. The road was now open to the evolution of what we term "higher" life forms. But before really complex organisms could evolve, the selfish, aggressive charac- teristlcs inherited from the ancestral single-cell species had to be tamed. Un- fortunately, some of the Controls that evolved----and which we have inherited ----do not always work. Conversely, they sometimes work too well.

J.M. Saúl has described how the ap- pearance of cáncer in complex multicellular organisms may be the conse- quence of the failure of biochemical controla evolved to curb cell aggression:

> **Such failure may be seen as reversión to ancestral cellular behavior, or as failure of a cell with a monocellular heritage to perform metazoan tasks for which it was not originally de- signed. In such instances, the re- sultant types of wild and indiscrimin- ate proliferation and variation would resemble pathologies classified as "cáncer."**

Furthermore, Saúl speculates, over-control could lead to autoimmune dis- eases:

> **Within the individual metazoan, cx- cessive antiproliferation measures would have occasionaUy resulted in focussed attacks against specialized classes of "innocent" cells, producing pathologies describable as "autoim- mune ."**

(Saúl, John M.; "Cáncer and Autoimmune Disease: A Cambrian Couple?" Geology, 22:5, 1994)

EPIDEMICS

THE BLACK DEATH AND CCR5-delta 32

Plagues are not all bad, and the Black Death (bubonic plague) that swept into Europe from Asia in 1346 was no ex- ception.

It is now eommon knowledge that bacteria, insects, plants, and even humans can build up resist anees to poisons, diseases, and antibiotics. Mutations tire always occurring; some good, some neutral, some bad. It has been found that a human mutation de- signated CCR5-delta 32 confers immunity to AIDS if inherited from both parents. People carrying the CCR5-delta 32 mutation lack the receptors to which the AIDS virus must attach itself if it is to infect the person.

What has all this to do with the Black Death?

> **Although the origin of the mutation is obscure, it appears to have sud- denly become relatively eommon among white Europeans about 700 years ago. That increase suggests that something must have occurred about that time to greatly favor the survival of people carrying the mutation.**

What biological catastrophe decimated Europe 700 years ago? The Black Death. One-quarter to one-third of the Europeans succumbed between 1347 and 1350. The Black Death strongly modified the European gene pool, increasing the fre- queney of CCR5-delta 32. This mutation may not have had any direct effect on the plague itself. It may just be a quirk of fate that the survivors of the Black Death had a higher frequeney of the CCR5-delta 32 mutation, and it is doubly quirky that the mutation confers a resistance to AIDS, which is a recent human affliction.

About 10% of whites of European origin now carry the CCR5-delta 32 mutation. The incidence is only 2% in central Asia. The mutation is completely absent among East Asians, Africana, and American Indiana.

(Brown, David; "AIDS Resistance Might Be a Legacy of Plague Survival," Dallas Morning News, May 18, 1998. Cr. D. Phelps)

Comment. This is all very interesting but also totally circumstantial.

A PLAGUE ON THEORIES

The Black Death that swept through Europe between 1347 and 1351 is always linked to the bubonic plague in the history books. In reality, the bubonic plague survives today, cropping up now and then in miniscule appearances in the American Southwest, for example. These outbreaks, however, little resemble the Black Death pandemic.

While both the bubonic plague and Black Death are characterized by dark, swollen lymph glands, the same symptom is seen in other diseases. In fact, the differenees between the bubonic plague and Black Death are more compelling than their similarities.

In their 2001 book Biology of Plagues, S. Scott and C. Duncan became medical heretics by proclaiming that the Black Death had to be some disease other than the bubonic plague. Since the Black Death killed a third of Europe's popula- tion, it is vital that we get this story right.

Here are five points emphasized by Scott and Duncan.

•The bubonic plague is intimately associated with rodents and the fleas they carry, but the Black Death thrived at temperatures too coid for fleas to hatch. It even appeared in Iceland which was then devoid of rats.

•The Black Death raced from Mar- seilles to París at the rate of 4 kilo- meters per day—much too rapidly for a rat-carried epidemic.

•The Black Death leapfrogged many European towns sometimes sparing swaths of territory 300 kilometers wide.

•The Black Death was far more con- tagious than the bubonic plague: 33% vs. about 2%.

•The Black Death seems to have been transmitted person-to-person—directly rather than indirectly via rat fleas.

The Black Death peaked 1348-1351 bul it hung around until the Great Plague of London in 1666, after which it mysteri- ously disappeared. Scott and Duncan hold that the Black Death was actually caused by a virus that suddenly mutated into a deadly form and just as suddenly turned harmless. Like the 1918 flu pandemic, which also mysteriously appeared and disappeared, the Black Death may be only a mutation away from striking again.

(MacKenzie, Debora; "All Fall Down," New Scientist, p. 34, November 24, 2001.

STROKE

STROKE DEATH ZONE

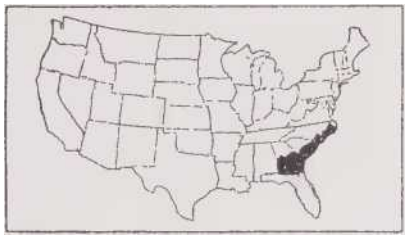
People living in the región of North America indicated on the map have a significantly higher risk of suffering fatal strokes. For those 35-54 years of age, this risk is twice the natural aver- age. Such a large unexplained datum is fair game for Science Frontiers, where

all such discrepancies and ehallenges to scientiflc understanding find shelter.

In the area in black, medical statis- tics confirm that about 1,000 more stroke deaths occur than average. Non-fatal strokes are also more prevalent, al- though no statistics are available.

Poverty may be a factor, but re- searchers at Wake Forest University say this cannot fully explain the extra deaths.

(Anonymous; "Death Zone for Strokes," Science News, 151:309, 1997)



Zone of extra-high risk for strokes.

CURES?

HOW HOMEOPATHY MIGHT WORK

Although some people swear to the effi- cacy of homeopathy's "remedies," skeptics have been fond of pointing out that these fluids are so dilute that no molecules of the active ingrediente are likely to remain. Believers respond that the fluid remedies somehow retain the "essence" of the active ingredient. In effect, they maintain that water has a "memory." No wonder mainstream scien- tists scoff at homeopathy.

But wait, perhaps water can have a memory! A Cal Tech ehemist has put extremely dilute Solutions under his electrón microscope and found that some contain strange "ice" crystals, even though room temperature and pressure prevail. Called "Ig crystals," they are produced through the action of ions.
They are stable even at higher tempera- tures.

Subsequently, an immunologist at the University of California at Los Angeles discovered that the Ig crystals can stimu- late parts of the immune system. Water containing these strange forms of ice show a hundred times more bioactivity than plain water.

(Anonymous; "Homeopathy and Ig Cry- stals," Spectrum, p. 18, November/ December 1998. Cr. E. Fegert)

Comment. Of course, we want to see independent confirmations of the Cal Tech and UCLA work, but we hope they will be objective rather than the usual knee-jerk reactions to homeopathy. See vol. 1, pp. 317, 318 for past confronta- tions over homeopathy.

DR. INTERNET

You can order books, airplane tickets, and a host of other producís and Services over the Internet. Soon, perhaps, you will also be able to order and actually acquire medicines without leaving your cozy Computer chair. This would be a great boon to shut-ins and PC potatoes.

J. Benveniste, a French researcher, claims that he has developed a way to transmit the essence of homeopathic remedies electronically. He states that homeopathic Solutions emit characteristú: electromagnetic "signatures." These signatures, he continúes, can be de- tected by a copper coil surrounding a beaker containing the solution. By digitizing these electromagnetic signatures, he plans to transmit them over the Internet to similar coil-surro.unded beakers containing puré water. The signáis are picked up by the puré water and the medicine's signature conferred. Presto! The medicine has been conveyed as surely as by a Startrek Transporter beam.

Skeptics will have none of this on three counts:

(1) Homeopathy is of no valué. It relies upon highly dilute Solutions of substances that in large doses cause the symptoms of diseases. This makes no sense to most scientists.

(2) Homeopathic medicines are so dilute that no molecules of the active substances exist in most Solutions. How can nothing generate a characteristic signal?

(3) Even if the active substance were present in the solution, how could it generate an electromagnetic signature?

Nobel lauréate B. Josephson has chal- lenged Benveniste to particípate in a randomized, double-blind test.

(Jaroff, León; "Homeopathic E-Mail," Time, p. 77, May 17, 1999)

Reference. Benveniste has made the pages of Science Frontiers several times in the past in connection with homeopathy and the so-called "memory of water." (See above and vol. 1, pp.
317, 318.)

HOST TAPEWORMS FOR HEALTH!?

While K. Fujita, of Tokyo's Medical and Dental University, was studying tropical diseases in Borneo, he was amazed to discover how remarkably healthy the ehildren were, despite the heavy loads of parasites they carried. Fujita asked hiraself what seems iike a ridiculous questaon: Could some parasites actuaUy promote good health?

Ensnared by this thought, he tested the idea by introducing a tapeworm into his own gut. Both Fujita and tapeworm did well. So well, that Fujita now hosts four thriving tapeworms!

Fujita wonders why his colleagues are not interested in his experiment. They don't invite him to their meetings anymore.

(Anonymous; New Scientist, p. 116, New Scientist, February 24, 2001)

CHEMICAL REACTIONS

SMOLDERING CORPSE

Most cases of SHC (Spontaneous Human Combustión) are written off by mainstream scientists (if they acknowledge the phenomenon at all) as easily explain- ed by the "human candle effect." The elementa of this accepted scenario are:
(1) An ignition source, say, a fireplace;
(2) The accidental ignition of the vic- tim's clothing and/or adjacent bedding or upholstery; (3) The rendering of fat from the (assumed) corpulent victim, which combined with the surrounding wick-like material simulates a candle; and (4) The nearly complete, slow con- sumption of the victim, who is assumed to be asleep, drunk, or otherwise unable to rescue himself. But some cases do not involve aH of these elemente, as in the following Ítem:

> Syracuse (AP)—Pólice have sched- uled an autopsy today for a woman whose body was found smoldering next to a cemetery tombstone.
>
> The woman's body was found lying on its back Wednesday afternoon next to a massive, 5-foot-high tombstone in St. Agnes Cemetery in Syra cuse by the cemetery's caretaker, pólice said.
>
> "We just don't know what hap- pened," said the Rev. James Fritzen who runs the cemetery for the Catho- lic Diocese of Syracuse. "We don't know if this was foul play or (some- one) grieving."
>
> Authorities have been unable to determine the age and identity of the woman because her body was charred.

(Anonymous; "Smoldering Corpse Found Lying next to Tombstone," Buffalo News April 15, 1993. Cr. L. Gearhart)

SMOULDERING CORPSE NOT SHC

That smouldering corpse that was found in a Syracuse cemetery (See above) turns out to have been a case of murded rather than SHC (Spontaneous Human Combustión). D. Nelson has confessed to stabbing the victim and ultimately dumping the body in the cemetery and set- ting it ablaze with gasoline.

(O'Hara, Jim; "Cop Reads Defendant's Confession," Syracuse Herald-Joumal, September 29, 1993. Cr. R. Barrow)

GENETIC

~~Since Volume I was published (1994), biologists have learned a nreat deal more about the human genome——what it is and what it isn'? It is "L mUCh S mal er th^ antici Pated Furthermore, its genes *are* often latent sources of Information and must be somehow "expressed" to be use- tul. The genome is also supplemented by poorly understood "epigenetic" phenomena, microRNAs, methylation, chaperone molecules, etc. See the later section devoted to genetics beginning on p. 160.~~

~~Nean^rtLu evolu tíon The *Afric* ™ Eve theory, possible links to Neanderthals, accuracy of molecular docks.~~

~~imn^U"mt n t i ^ impanZee differences Many similarities but also many important differences.~~ *1*

~~i. . *§ y° nd ^he human genome. Roles of nonsense genes and pseudoaenes "dark matter" regions in the genome.~~ ~~pseudogenes,~~

PATHS OF HUMAN EVOLUTION

Y1HEN HUMANS WERE AN ENDANGERED SPECIES

At one point during the last 400,000 years, the human population worldwide was reduced to only about 10,000 breeding men and women----the size of a very small town. What caused this population "bottleneck"? Did a population erash engulf the entire globe. If not, who was spared?

Such questions arise from a sur- prising observation: Human DNA is re- markably uniform everywhere humana are found. This hidden genetic uniform- ity is difficult to believe if one strolls through a cosmopolitan city like New York or París. Nevertheless, compared to the DNA of the great apes, whose mutation rates should be cióse to ours, human genes on the average show far fewer mutations. Human DNA from Tokyo and London is more alike than that from two lowland gorillas occupying the same forest in West Africa. Harvard anthro- pologist M. Ruvolo has commented: "It is a mystery that none of us can expiaba ."

The olear implication is that humans recently squeezed through a population bottleneck, during which many accumu- lated mutations were wiped out. In a sense, the human race began anew during the last 400,000 years. Unfortunately, DNA analysis cannot say where the very grim reaper carne from.

(Gibbons, Ann; "The Mystery of Human- ity's Missing Mutations," Science, 267: 35, 1995)

Comment. The hand that wiped the slate olean, or nearly so, might have been a meteor impact, a pandemic, the Ice Ages, a flood, volcanism, etc. Whatever it was, it seems to have largely spared Africa. The chimps and gorillas there apparently did not pass through the bottleneck. Even more interesting is the observation that the DNA of Subsaharan Africans does shows more variability and therefore seems older than that from humans elsewhere on the planet. (See our catalog Biological Anomalies: Humans III.) Or perhaps Subsaharan DNA only seems older because it was not foreed . through that bottleneck. There are implications here for the African Eve theory.

HAS HUMAN EVOLUTION BEEN DIRECTED BY BACTERIA?

With considerable fanfare, a multinational team of scientists has announced that the mtDNA (mitochondrial DNA) "squeezed" from a 29,000-year-old Neanderthal skeleton found in the northern Caucasus differs by 3.48% from the mtDNA of a 40,000-year-old Neanderthal skeleton from (fittingly) Germany's Neander Valley. Furthermore, both mtDNA samples differ from that of modern humans by a sub- stantial 7%.

These two innocent-appearing, widely publicized numbers have far-reaching implications:

(1) Modern humans and Neanderthals are only very distantly related, and they certainly never interbred, as suggested in many recent, populen* articles; and

(2)Since neither Neanderthal mtDNA sample is closer to that of modern Euro- peans than it is any other modern human population, the so-called "multiregional" theory of human evolution and dispersión is unlikely to be correct. Thus, the out- of-Africa theory is favored.

These data and. their implications stimulate several observations and com- ments; only one of which ís mentioned in the references given below.

F.H. Smith, an anthropologist from Northern Illinois University and a sup- porter of the multiregional theory, opines that 30,000-40,000 years ago the mtDNA of the early humans, who were mixing it up with the Neanderthals was certainly very different from what it is today. Since mtDNA mutates rapidly, way back then human mtDNA might have been much more like that of the Neanderthals.

(Ovchinnikov, Igor Y., et al; "Molecular Analysis of Neanderthal DNA from the Northern Caucasus," Natúre, 404:490, 2000, Bower, B.; "Salvaged DNA Adds to Neandertals' Mystique," Science News, 157:213, 2000. Donn, Jeff; "Neanderthal DNA Has Little Human Link," Austin American-Statesman, March 29, 2000. Cr. D. Phelps)

Comment. From among many possible comments, we settle for just one: It is relevant that mtDNA is not the nDNA (nuclear DNA) that is the primary de- terminant of an animal's morphology and other attributes. Scientifíc consensus now holds that mtDNA comes from bacteria that invaded complex cells (eukaryotes) and set up housekeeping in them eons ago. The mitochondria are called "endo- symbionts," but we must wonder how symbiotic they really are. Not only does mtDNA mutate much faster than nDNA ("our" DNA), but the mitochondria the mtDNA serveB must have different evolu- tionary goals from us; that is, mitochondria might really be parasites and we are their hosts!

THROWING SAND IN THE GEARS OF MOLECULAR CLOCKS

African Eve Gets a Lot Older. It is widely accepted as fact that all women are de- scended from an African "Eve" who lived between 100,000 and 200,000 years ago. This conclusión was based upon mtDNA (mitochondrial DNA) studies that as sume that mtDNA is inherited only from mothers. This assumption has been repeated so often that few ever question it. However, two recent studies seem to show that some paternal mtDNA actually does get into eggs and recombines with maternal mtDNA. This unexpected invasión makes the mtDNA dock run more slowly. So, African Eve, if she ever existed, is pro- bably twice as oíd as originally thought.

(Day, Michael; "All about Eve...," New Scientist, p. 4, March 13, 1999)

Maybe There Were Two Eves! Not only has African Eve aged precipitously but there may have been a non-African Eve, too. J. Hey and E. Harris, at Rutgers, have presented data suggesting that the famous African Eve was the mother of only modern sub-Saharan Africans. Every- one else seems to have descended from an entirely different Eve. These data, if confirmed, demolish the African Eve theory and support the often- reviled multiregional theory of humans origins.

(Pennisi, Elizabeth; "Genetic Study Shakes Up Out of Africa Theory," Science 283:1828, 1999. Bower, B.; "DNA Data Yield New Human-Origins View," Science News, 155:181, 1999)

Genetic Clocks Are Fickle. mtDNA docks have implied that modern birds and mam- mals were contemporaneous with dinosaurs, and that some animáis evolved millions of years before their first fossils. For good ' reasons, evolutionists are becoming wary 'about these molecular docks. It is fast becoming obvious that:

> **Clocks tick at different rates in different lineages and at different times. And new work on the biology of mitochondria suggests that their evolution may be more complicated than re-**

searchers had suspected.

Strauss, Evelyn; "Can Mitochondrial Clocks Keep Time?" Science, 283:1435, 1999)'

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C

HUMAN/CHIMPANZEE DIFFERENCES

r

A GENETIC DISCONNECT

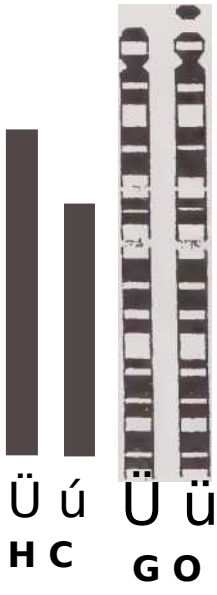
If human and chimpanzee nuclear DNAs differ by only 1.5%, why are the two species so profoundly different in ana- tomy and behavior?

The obvious external differences are body hair, the use of language, the method of locomotion, and of course culture. Less well known is the fact that humans are more susceptible to diseases like as cáncer and AIDS.

Apparently, superficial eomparisons of DNAs slough over genetic details that result in major differences in the living animáis.

Some of the genetic differences be- tween humans and ehimps seem to belie that miniscule 1.5% difference everyone bandies about. To illustrate, humans have only 46 chromosomes, while the great apes all have 48. The 1.5% figure doesn't hint at this significant difference. Next, take a look at chromosome #9 in humans and the great apes. Chromosome bandings are different enough to raise further suspicions about the 1.5% figure.

(Gibbons, Ann; "Whieh of Our Genes Make Us Human?" Science, 281:1432, 1998)



Bandings on chromosome-9 from humans (H), chimpanzees (C), gorillas (G), orang-utans (O).

Comments. It is easy to see how gross eomparisons of DNA might miss important details. The popular "DNA-hybridization" method simply mixes together strands of DNA from the two species being compared. These are allowed to combine, and then they are heated to see how much temperature is required to forcé them apart. Chromosome numbers and bandings have little if any effect on these crude eomparisons of the bare DNA strands that have been stripped from their genes and chromosomes.

The significance of all this transcends the eomparisons of humans and ehimps. Modera taxonomy of all life forms depende increasingly upon DNA compari- sons rather than upon morphology. If DNA eomparisons can be as misleading as they are in humans and ehimps, those textbook family trees that are supposed to tell us how life evolved may also be giving us an erroneous history of life.

To underscore the problem, sometimes DNA genetic differences do not result in big morphological changes. For example, Three-toed Woodpeckers hammer on trees all over the northern reaches of North America and Eurasia. These birds all look alike and interbreed freely. Yet, some of the birds differ so much geneti- cally that they should be classified as different species on that basis. (See our catalog Biological Anomalies: Birds.)

THE HUMAN-CHIMPANZEE GAP

The genomes of human and ehimps are said to differ by only 1-2%. This dif- ferene seems too small to account for the very large differences between these two species in both physiology and behavior. The prevalent explanation of this wide gap is that, although the two genomes may look alike, the genes in them are expressed differently. Obviously, the oíd one-gene/one-protein concept has been discarded. And there is much more to the story.

In pursuit of this story, geneticist . S. Paabo has studied gene expression in humans, chimpanzees, and macaquea.

> **The analysis shows that the human brain has undergone three to four times the amount of change in genes and expression levels than the chimpanzee brain since the two split off from a common ancestor. "Among these three tissues, it seems that the brain is really special in that humans have accelerated patterns of gene activity," Paabo says.**

(Normile, Dennis; "Gene Expression Differs in Human and Chimp Brains," Science, 292:44, 2001.)

Comment. The above reference does not confront the question of wliy human gene activity accelerated relativa to our cióse cousins. Was there are gene muta- tion or did the same genes act differently? If the latter, the question of WHY reappears; that is, why did nearly identicol genomes located at the same place at the same time take off in different directions?

TOO CLOSE TO BE SO FAH

Anthropologists have long searched for transitional fossils that demónstrate a cióse evolutionary relationship between humans and chimpanzees----those famous "missing links." Fossilwise, though, humans and ehimps remain sharply different despite much digging around Africa.

DNA-wise, however, the two species are very cióse (98.5% identical in some studies). This being so, how does one account for the great physiological and behavioral gaps that sepárate the species? Scientists are trying to come up with genetic explanations.

Faster gene expression. According to S. Paablo and his colleagues:

> **We're set apart from other primates not so much by differences in the makeup of our genes but by relative- ly recent changes in how active these genes are. Such changes are most dramafie in the brain, where they've occurred at a faster rate in human than in the other primates.**

(Pennisi, Elizabeth; "Gene Activity Clocks Brain's Fast Evolution," Science, 296: 233, 202.)

Comment. Well, O.K.; but what caused these changes in gene activity that made us human? If this cause still active? Are new humans now being forged?

Because of faster changes in sperm proteins. Another way to account for the human-chimpanzee gap is to find genes that have changed dramaticaHy since the two species split 5 million years ago.

According to C.-B. Stewart and colleagues, a group of genes that code for proteins involved with binding sperm proteins changed "screamingly fast" in the last 5 million years. In other primates changes in these genes have been miniscule.

(Cohén, Philip; "A Big Hand for the Little Guys," New Scientist, p. 16, March 2, 2002.)

Comment. It is unelear how these particular gene changes could account for the large physiological and-behavioral differences we see today.

Could it be that genes per se don't really matter that much? It's more how genes are "expressed" or used. If so, where are the real blueprints for humans stored? And, of course, the key question: How were they drawn up? By random changes in the blueprints?

Given the recent discovery of the bones of 7-million-year-old hominids, it is not impossible that chimpanzees descended from hominids rather than vice versa!

HUMAN-CHIMP DNA DISSIMILARITIES

It has been proclaimed widely that human and chimpanzee DNAs are 98%+ alike. This daim seems rather ridieulous in the light the the following differences.

- **Humans have 23 pairs of chromosomes compared to 24 for the ehimps.**

- Humans are unique among primates having very short telomeres; i.e., those repeating DNA sequences at the ends o£ the ehromosomes.
- Chromosomes 4, 9, and 12 are markedly different between humans and chimpanzees.
- Human and chimp Y chromosomes are of different sizes with many markers that do not line up at all.
- The chimp genome is 10% larger than a human's.

(Dewitt, David A.¡ "98% Chimp/Human DNA Similarity? Not Any More," TJ, 17:8, no. 1, 2003. TJ = Technieal Journal.)

BEYOND THE HUMAN GENOME

OH, THB COMPLEXITY OF IT ALLI

The headlines say that the human genome has been charted and further imply that we now can read Üfe's total blueprint. Closer studyof the announce- ment reveáis that there still remain unreadable snippets of the genome here and there. In fact, the total number of human genes is still in doubt: maybe 30,000, some say 120,000. This wide range of uneertainty does not inspire belief in the accurate readability of this biological blueprint at the present time.

Usually left unsaid is the fact that the present blueprint covers only 2-3% of the territory. That's right, 97-98% of the human genome isn't mapped at all. This uncharted territory is assumed to be "junk" or "nonsense" DNA that plays no role in heredity. Want to bet that this assumption is correct? And don't forget that genes jump around. The genome is really a moving target.

Genes also work in concert. It is not one gene eoding for one protein, which then has a singular role in crea- ting an operational human being. For example, some 5,692 genes are active in breast-cancer cells. Genes may also have múltiple roles. Our present blueprint of the human genome does not display all the mobility and complex ínter relation- ships of the genes.

We do know that genes are the blue- prints for the manufacture of proteins. Of these, there may be over 1,000,000 different----more than ten times the number of genes! These multitudinous proteins are continually being created and transported to where they perform their assigned tasks and are eventually deconstructed. It is this population of proteins (collectively the "proteome") that develops organisms and gives them life. We do not begin to have a blueprint for the proteome, which really tells us how life works.

Then, there are epigenetic influences. "Epigenetic?" Yes, the manufacture of proteins according to genome blueprints is. altered by Chemical groups that attach themselves to strands of DNA. Methyl groups, for example, can completely silence genes. Scientists are struggling to understand just how epigenetic factors affeet inheritance and the creation of new species.

There is much more to biology than DNA and genes. The genome is complex enough, but the proteome adds still another layer of complexity, and epigenetic spoons stir the pot further.

(Ezzell, Carol; "Beyond the Human Genome," Scientific American, 283:64. July 2000. Anonymous; "Some Baseless Speculations," The Economist, p. 83, May 27, 2000. Cr. J. Cieciel. Note the pun in the second title!)

Comment. Let us look down the scale of complexity to the relatively sin all number of Chemical elemente, and even further down to electrons and protons, perhaps as far as quarks, gluons, etc. Is it reasonable to suppose that within these supposed elementary partióles there exists the potential for the unfolding of the million-member proteome? Are electrons and protons fraught with such immense potential? Can or must the apparently simple properties of the elementary partidos lead to the flower- ing of human beings? Or even to more complex entities?

DARK MATTER IN ODR GENOME!

Gene-counters are having difficulty in determining the precise number of genes in the human genome. Messing up the tallies are some 1,000 pseudogenes (non-, funetioning genes—supposedly!). In addition, the very definition what constituí es a gene is under scrutiny. To illustrate, many individual genes can code for different proteins; some must combine with other genes to make cer- tain proteins. (As in the case of human hemoglobin; p. 170.) However, the real worry is "dark matter"------not the kind that perplexes astronomers.

> Even worse, parts of the genome have proven completely impenetrable to the best gene-prediction programs. They inelude dark matter, regions named because they "are apparently devoid of genes," says Roderic Guigo, a computational biologist at Pompeu Fabra University in Barcelona, Spain. Gene-prediction pros know nothing about this dark matter. Many worry that this void contains genes that researchers just can't Bee.

Guigo speculates that these dark-matter genes may possess characteristics that geneticists do not yet recognize.

(Pennisi, Elizabeth; "Gene Counters Struggle to Get the Right Answer," Science, 301:1040, 2003.)

Speculation. Future species and/or new capabilities are being formulated in the dark-matter portions of the genome.

Comment. On p. 163, we also applied the term "dark matter" to those mys- terious "micro-RNAs."

YOD MAY BECOME WHAT YOD EAT

When we scarf down a hamburger, we ingest bovine DNA. The textbooks say that this alien DNA is destroyed during digestión. Otherwise, it might "somehow" be incorporated into our own DNA, lead- ing in time to our acquisition of some bovine characteristics! You'll recall that cannibals thought to acquire the virtues of their slain enemies by grabbing a bite or two! But this all sounds pretty far- fetched, doesn't it?

Maybe not. When W. Doerfler and R. Schubbert, at the üniversity of Cologne, fed the bacterial virus M13 to a mouse, snippets of the M13's genes turned up in cells taken from the mouse's intes- tines, spleen, liver, and white blood cells. Most of the alien DNA was eventually rejected, but some was probably retained. In any event, alien DNA in food seems to make its way to and sur- vive for a time in the cells of the eater.

(Cohén, Philip; "Can DNA in Food Find Its Way into Cells?" New Scientist, p. 14, January 4, 1997)

Comment. We are only half-kidding when we ask if food consumption could affeet the evolution of a species. After all, our cells already harbor mitochon- dria, which are generally admitted to have originally been free bacteria that were "consumed" by animal cells. The process even has a ñame: "endosymbio- sis." (See: vol. 1, p. 189.)

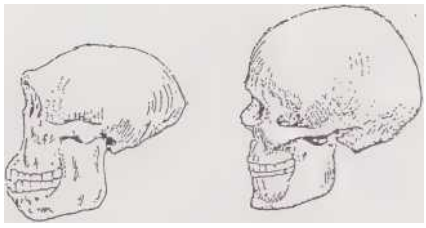
SKELETAL REMAINS

HOMO ERECTOS NEVER EXISTED!

The record of human evolution is littered with skeletons---not only the legitímate bones of early hominids but also with discarded evolutionary charts and dis- credited taxons. A taxon is a well- defined biological classification, such as a phylum or species. We modern humans are given the label Homo sapiens. We are told with great assurance that we evolved from earlier hominids, such as Homo erectus and, perhaps, Homo neanderthales. Homo erectus has long been a key feature of all those charts of human evolution decorating our textbooks. But this venerable taxon is getting fuzzier and fuzzier.

> Reappraisal by Cornell üniversity paleontologists of a 200,000-year-old skull from India's Narmada River sug- gests that the fossil was probably a Home sapiens---not a Homo erectus—and marks another spot of the globe where humans may have evolved.

The reappraisal of Narmada Man preceded the recently announced discovery of two Middle Pleistocene fossils from Yunxian, China, that seem to share the traits of Homo erectus and Homo sapiens. Kennedy would like to bury the taxon Homo erectus altogether, "Those who would like to keep the taxon see a 200,000- year-old Narmada Man as a last gasp for Homo erectus," he said.



(Left) Homo erectus skull. (Right) Homo sapiens skull. Are these markedly different skulls representativo of two different species or merely variants of the same species?

What will the anthropologists do now with all those skulls they labeled so confidently as Homo erectus? Actually, the possibillty underscored by Narmada Man is that modern humans evolved almost símultaneously in several parts of the planet, not just in Africa.

(Anonymousj "Homo erectus Never Existed?" Geotimes, 37:11, October 1992)

UNRECOGNIZED HOMINIDS

IF FINGERPRINTS DON'T LIE, NEITHER DO TOE PRINTS

J. Chilcutt is a highly regarded finger- print expert for the Conroe, Texas, Pólice Department. In his spare time, he collects flngerprints and toe prints from other primates. Working with zoo ofñcials, who were naturally skeptical at first, Chilcutt has amassed a collection of about 1,000 nonhuman primate prints. He has discovered that print characteristics differ markedly from one species to another.

When Chilcutt learned that J. Meldren, a professor of anatomy at Idaho State University, had accumulated 100 or so casts of Bigfoot prints, he had to check out their dermal whorls and arches.

Some of Meldren's casts turned out to be obvious fakes upon which human fingerprints had been impressed. But a few specimens surprised him.

> The print ridges on the bottoms of ñve castings—which were taken at different times and locations----flowed lengthwise along the foot, unlike human prints which flow from side to side.

> "The skeptic in me had to believe that (all of the prints were from) the same species of animal," Chilcutt said. "I believe that this is an animal in the Pacific Northwest that we have never documented."

(Rice, Harvey; "Is Something Afoot with Bigfoot? Print Expert Thinks So," Houston Chronicle, February 20, 2000. Cr. D. Phelps)

BIGFOOT MILE- HIGH, BUT LIGHT- YEARS FROM ACCEPTANCE

Colorado is not prime Bigfoot country. Most Bigfoot reports come from the Pacific Northwest. Nevertheless, enough Bigfoot sightings, hearings, and foot- prints have accumulated in the Rockies for the Denver Post to print a lengthy review of the Bigfoot phenomenon.

The article identifies three Colorado hotspots: (1) Leadville, where the Little Creek Monster was reported as early as the 1880s; (2) the Southern San Juan Mountains; and (3) Pike National Forest.
A few reports even come from the plains east of the Front Range.

> Coloradans have reported seeing the animáis walking along a stream below Loveland Pass, drinking from a pond in the Lost Creek Wilderness, running after deer in the Roosevelt National Forest, chasing cars near Gypsum and roaring at hikers, campers and fisher- men in various locations. The reports have come from scientists, wildlife biologists and elk hunters.

Surely, this enough to convince everyone of Bigfoot's reality. Not so! To recognize Bigfoot officially scientists must have a living specimen, a corpse, or at least an good skeleton. They do not.

Even though there are thousands of Bigfoot sightings recorded continent-wide plus hundreds of casts of huge foot- prints, these are not enough. Just as with ÜFOs and sea monsters, fraud and misidentification abound in that field of endeavor called "cryptozoology."

However, bigfoot researchers do have one advantage over UFO and Loch Ness aficionados j namely, those hundreds of casts of outsized footprints. Some are so detailed that the skin's ridge patterns are clearly apparent. These ridge patterns ("dermatoglyphs") do not seem to match those of human feet or any of the other great apes.

This is aü very good, and some scientists are impressed by the sheer magni- tude of the evidence. As G.W. Gilí, a professor at the University of Wyoming, comments: "Either the most sophisticated hoax in the history of anthropology has gone undiscovered for centuries, or the big ape exists." [Of course, the same can be said for UFOs and Nessie.]

On the other hand, if Bigfoot is so ubiquitous, as claimed, why do not the many hunters of lions and bears, who scour the Rocky Mountain wilderness aided by dogs, ever submit credible Bigfoot reports. If Bigfoot is really out there, these woods-wise hunters should have seen him or her.

We still need that Bigfoot specimen, dead or alive.

M. Shermer, editor of Skeptic, speaks for most of mainstream Science:

> If you believe in Bigfoot, you most likely believe in the Loch Ness monster, the lost continent of Atlantis, whatever.

(Stein, Theo; "Not All Scientists Doubt Bigfoot Now," Denver Post, January 14, 2001. Cr. G. McCudden and D. Phelps)

Distributi'on of Bigfoot/Sasquatch evidence in North America. Most sightings come from the Pacific Northwest, lesser numbers from the cross-hatched región. Sporadic claims, often of questionable provenance, come from virtually every State and province. (From: Biological Anomalies: Humans III)

OTHER MAMMALS

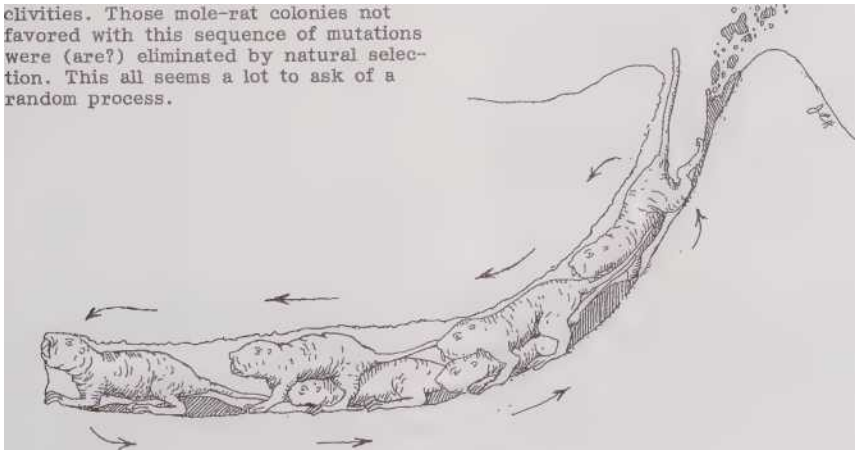
IT'S A MOLE-RAT, JIM, BÜT NOT AS WE KNOW IT

Naked mole rats are the most social of all the mammals. They live in underground coloides with a social structure like that of ants and termites. There are castes of workers, and only the queen, an oversized female, breeds. Naked mole rats are also intensely xenophobic; they avoid or fight with other mole-rat coloides. But such tightly closed societies lead to inbreeding with all its deleterious effects. For naked mole rats to survive over the long term, a biological solution to the inbreeding problem had to be found. ,

The response of the speeies to this threat is the occasional production of a "dispersive morph." The largest and most successful coloides produce-----somehow---a larger-than-normal individual, almost always a male, that is fuelled with extra fat and possesses a yen to travel. He is disinclined to mate with the resident queen, preferring to leave the eolony for amorous adventure elsewhere. Thus, intercolony gene flow is established.

(Gee, Henry; "It's a Mole-Rat, Jim, But Not As We Know It," Nature, 380:584, 1996. O'Riain, M. Justin, et al; "A Dispersive Morph in the Naked Mole-Rat," Nature, 380:619, 1996)

Comment. Of course, the naked-mole-rat eolony, even when thought of as a "superorganism," cannot perceive the future consequences of inbreeding. The invention of a "dispersive morph," according to evolutionists, has to come from a sequence of random mutations that over time créate a special individual, specially fuelled and with abnormal propclivities. Those mole-rat colonies not favored with this sequence of mutations were (are?) eliminated by natural selection. This all seems a lot to ask of a random process.



Naked mole-rat colonies are highly cooperative (eusocial). Mere, an excavatlng team digs a.iunnel using an endless-chain technique. Lead mole rats move backwards and underneath carrying out spoil. After disposing of it at the surface, they crawl forward on the backs of the dirt excavators. Perhaps even more remarkable is their díspatch of physiologically modified "dispersal morphs" to found new colonies.

A TALL TALE OF EVOLUTIONISTS

Darwin himself proposed that giraffes evolved their long necks so that they could browse foliage beyond the reach of shorter herbivores. All school children learn this story. It is presented as another "proof" of evolution, and it is so reasonable that is usually accepted without challenge.

One ecologist has now broken ranks. (Too bad about his careerl) R. Simmons, at Namibia's Ministry of Environment and Tourism, thinks that giraffes evolved their long, powerful necks because the males wrestle with them when competing for females. Genes coding for the big- gest, strongest necks are thereby passed along preferentially irrespective of eating habits. Simmons comments:

> "I hate to say Darwin was wrong, sinee he was obviously a brilliant ehap," says Simmons; "but perhaps I've added a little something to a question he didn't think right the way through."

In support of his revisionism, Simmons, who should know, says that giraffes actually feed mainly on low bushes with their necks bent. The evolutionists evidently carefully select the textbook photos, because they usually show giraffes reaching high for acacia leaves. That's the politically correct pose. We've never seen a video or photo of a giraffe reaching down for low-level vegetation!

(Anonymous; "How the Giraffe Got Its Neck," Discover, 18:14, March 1997.)

Comment. The necks of female giraffes average a couple feet shorter than those of the males. If the standard evolutionary scenario is correct, the females got short-changed neck-wise, not to mention less access to food than the males. It would not seem advantageous to the speeies to have underfed pregnant females.

IS OLIVER A "HUMANZEE"?

Oliver: male, 30ish, very hairy, height 1.2 meters, weight 50 kilos, erect posture, unusual ears, offensive odor. Oscar always walks on two feet, uses a human toilet (which he flushes), can mix drinks, and enjoya a cup of coffee and a nighteap. Chimps ignore him; humans wonder what he is.

Superfieially, Oscar is definitely chimp-like; but shave his head and he becomes eerily human. Although Oscar was widely exhibited in the 1970s, his fame diminished in the 1980s. But now, scientists want to count his chromosomes and find out what he really is. One sug- gestion is a cross between a chimpanzee and a bonobo (a "pygmy chimpanzee"). Or how about a chimp-human hybrid? • There have been dark rumors of hush- hush experiments in China, Italy, and the U.S.

We'll let you know what the geneticists conclude----unless there is more "hush-hush."

(Holden, Constance; "'Mutant' Chimp Gets a Gene Check," Science, 274:727, 1996. Also: Anonymous; "Oo-be-doo, I Want to Be Like You," Fortean Times, no. 95, p. 15, February 1997)

OLIVER IS ALL CHIMP!

That aberrant chimp, Oliver, described above, thought by some to be a human-chimpanzee hybrid, is 100% chimpanzee say geneticists at the University of Texas. Even so, Oliver always walks erect and can mix drinks! He's almost ready for prime primate time!

(Holden, Constance; "Oliver no 'Humanzee'," Science, 280:207, 1998)

MUMMIFIED LLAMAS YIELD SUPERIOR WOOL

The wool found on a group of mummified llamas that had been sacrificed and buried some 1,000 years ago in Perú had hair far finer than cashmere and far superior to that of modern llamas. The ancient Peruvians apparently knew how to breed their animáis to accentuate certain features. Their secret was lost during the Spanish conquest.

(Anonymous; "Mummified Llamas Yield Superior Wool," NEARA Transit, 10:6, Spring 1998)

BEHAVIOR

APPARENT INTELLIGENCE HUNTING AND EATING

SHEEP FOIt CATTLE GUARDS

When farmers and ranchera wish to keep livestock from exiting a fenced pasture vía an entrance road, they can either install an inconvenient gate or a "cattle guard." The latter is a grid of metal bar a bridging a shallow pit. Cattle can- not croas because their feet would slip between the bar a. Neat idea! But some sheep, normally considered rather dull anímala with miniacule initiative, have invented a scheme to thwart cattle guarda. When they see greener pastures, in particular succulent gardens on the nether side of a cattle guard, one sheep volunteers (?) or is picked (we don't know whieh). It altruistically flings it- self across the grid and stoically endures while the rest of the flock trota across its body. The selfless sheep is usually marooned on the wrong side of the grid, but at least it has the pasture all to itself.

(Anonymous; "Selfless Sacrifi.ee Puts Sheep in Clover," London Times, March 20, 1997. Cr. A.C.A. Silk)

Comment. Yes, contrary to some animal behaviorists, animáis can be altruistic. Furthermore, sheep can size up a prob- lem, conceive a solution, and act col- leetively.

BEARS LIKE HONDAS

In 1998, Yosemite's black bears smashed and clawed their way into 1,103 automo- biles, causing $634,595 in damage. Al= though the bears have developed specia- lized techniques for each car model, they favor Hondas and actively teach their cubs just how to do it. Of course, the bears are after food, not the Hondas per se, but this Ítem seems appropriate here!

(Fialka, John J.; "Yosemite's Bears Have a Taste for Hondas," Chicago Sun-Times, January 25, 1999. Cr. J. Cieciel)

ANIMAL ANTICS

Every so often, we like to print a few of the more curious cases of animal be- havior we come across.

Carnivorous sheep. Sheep grazing in British scrubland occasionally lunch on grouse—particular very young birds.

(Anonymous; Herald Sun, p. 9, Febru- ary 31, 2002.)

Comment. Herbivores grazing along the seashore do not disdain crustaceans they can catch. Flesh is not the primary ob- jective. Rather, it is the minerals the animáis' bones contain.

CARNIVOROUS HIPPOS

Hippos have always seemed to be consum- mate herbivores; but in Hwange National Park, Zimbabwe, one killed an impala that had fled into a pond in order to escape wild dogs. It tasted good, and soon ten other hippos were enjoying a communal feast.

(Anonymous; "Carnivorous Hippos," Natural History, 108:23, April 1999)

BEAKED WHALES ARE SUCKERS

They are, in fact, high-powered suckers with piston-powered gullets.

Beaked whales are rare and little-studied. A major mystery has always been how they captured and consumed their usual prey of flsh and squid. You see, they are functionally toothless.
The males have only two teeth at the tips of their snouts, which they seem to use mainly for fighting. The teeth of the femóles rarely erupt at all. (See our eatalog Biological Anomalies; Matn- mals I.) Despite these dental handicaps, beaked whales are always fat with slip- pery prey. How do they catch and hold their prey?

J. Heyning and J. Mead decided to check out some museum specimens.

> They found that the tongue was very loosely connected to the bottom of the mouth, and that the liyoid bones at the base of the tongue were great- ly enlarged. The muscles attaclied to the hyoids were also unusually large to move the tongue rapidly backward in the mouth. It looked, says Mead, as if a pump-like retraction and the distensión of the throat would create a sudden drop in pressure, allowing beaked whales to suck in their prey.

(Barnett. Adrián; "Pouting Whales Are Suckers for Squid," New Scientist, p. 17, February 1, 1997)

ANOTHER SUCKER

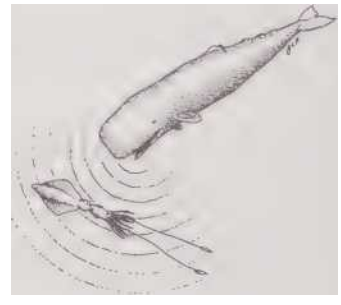
Female beaked whales are usually toothless, and the males only have a couple cf teeth that are used for fighting rivals. Yet, these whales have no problem cat- ching and consuming their swift, fishy prey. Apparently, they first stun their dinners acoustically and then suck them in with the pump-like action of their muscular tongues. (See our eatalog: Biological Anomalies: Mammals I.)

Occasionally, whalers have caught sperm whales with congenital, grossly twisted jaws that are completely useless in hunting, yet these animáis thrive on a rich diet of fast, elusive squid. A. Werth of Hampden-Sydney College theo- rizes that these much larger cetaceans also suck in their prey just like the beaked whales.

Sperm whales also generate sound pulses so strong that they can very likely stun the giant squid, their pre- ferred food, as they pursue them with their sonar in mile-deep blackness.
(See Mammals II)

(Pennisi, Elizabeth; "Corning to Grips with Whale Anatomy," Science, 283:475, 1999)

Comment. Sperm whales and beaked whales are only distantly related, so that we have an interesting example of the triple parallel evolution of hunting strategy, acoustie-stunning capability, and large, piston-like tongues.



Sperm whales and probably other cetaceans may stun their prey with high intensity sound. Then, they just engulf or suck in their victims.

IMPRISON WILLY!

Killer whales get good press and com- plimentary movies, too. They are usually portrayed as gentle, intelligent, human-fi'iendly marine mammals that dina only on fish. Lately, though, we have been reading that Alaskan killer whales have been snacking on those cute little sea otters.

Much more devastating to the killer-whale image is an article in Natural History describing the vicious attack of a pack of killer whales on a pod of much larger sperm whales 70 miles off the California coast. To ward off the attack, nine sperm whales had formed a rosette, heads together, with their powerful tails splayed outwards towards the enemy. The

táller whales circled the sperm whales ominously. Every so often, one would dash in and tear off a huge chunk of ■ blubber. Eventually, all nine sperm whales floated dead or dying in an ocean of blood.

The "gentle-giant" portrait of the táller whale is tarnished further in the Antaretic where they habitually diñe on the lips and tongues of minke whales, then leave them to die.

(Pitman, Robert L., and Chivers, Susan J.; "Terror in Black and White," Natural History, 107:26, December 1998/January 1999)

Comment. How will the media spin-doctor stories like these? Killer whales didn't get their ñame because they ate fish alone.

For those who are too young to re-member, Willy was the ñame of a killer whale in a movie entitled "Free Willy." The movie Willy seemed to possess many endearing human traits. Those who viewed the movie would never believe that Willy (or any killer whale) would engage in the vicious behaviors de- scribed above. The whale that .played Willy died in 2003.

•Pine martens are chewing through the electrical wiring of Swiss cars. Mam- mal repeliente popular there.

•British dormice seem to enjoy the electrical fittings of Rolls Royces.

•New Zealanders have to put metal collars on telephone poles to prevent bushy tailed possums from getting at the cables.

(Ager, Derek; "Unwary Animáis and Vicious Volts," New Scientist, p. 47, January 9, 1993)

Comment. We mustn't forget that sperm whale that got tangled up in an under- sea cable over a mile down!

THE SEVENTH-STORY PARADOX

About 90% of the cats that fall (or are pushed) from high rises between 2 and 32 stories high survive. Curiously, the death rate peaks at 7 stories and decreases the longer the fall. One explana- tion has the cats reaching their terminal velocities (about 100 kilometers/hour) during the longer falls. When descending at their terminal velocities, the cats feel no accelerating forcé and tend to relax, thereby increasing their cross sections and decreasing their rigidities. Injuries thus tend to be less serious!

(Bothwell, John, et al; "Who Needs Nine Lives?" New Scientist, p. 65, June 21. 2003.)

BIZARRE BEHAVIOR

BODILY FUNCTIONS

STONED DOGS

When Australian dog owners see their pets come home frothing at the mouth and disoriented, they know they have a drug problem-----not coke or pot but toads! The ugly, venomous cañe toad. *

Cañe toads are consummate pests in Queensland. Their venom is so powerful that would-be predators avoid them. Early on, domestic dogs gave them a wide berth, too. Then, somehow, one dog discovered that by gently mouthing a cañe toad, it acquired just enough venom to give it a high. Just how, we don't know, but in some way the Word was passed around the canine world, and toad-mouthing beeame widespread. Some dogs are so hooked that they sneak out at night for quick fixes and even ignore their food dish.

(Anonymous; "Feedback,[11] New Scientist, p. 96, July 24, 1999)

THE SWEET SEX

When female rodents eat meáis high in sweets, they produce twice as many female pups as males. The sex ratio is reversed when their diets are fatty with low sugar.

(Choi, Charles; "Sugar and Spice and Everything Nice," Scientific American, 289:26, July 2003.)

MAMMALS THAT ATTACK HDMAN TECH-NOLOGICAL INFRASTRUCTURE

We are accustomed to termites feasting on our homes' timbers and mice gnawing in the walls, but in recent years many species have developed a taste for more sophisticated fare:

BEWARE OF RAPIDLY ASCENDING ARMADILLOS

After watching armadillos awkwardly snuffling for tidbits, one might conclude that these "little armored ones" are not too bright and certainly no threat to humans. But armadillos possess a re- markable defense mechanism you should be aware of. Not all of them curl up into tight, nigh-impenetrable balls when threatened as the ñeld guides promise us. Instead, some suddenly jump straight up—as much as 8 feet high! Woe be to anyone hovering over armadillos favoring this type of defense. Broken noses, loosened teeth, and black eyes have been inflicted by these armored pro- jectiles.

(White, Robb; "Armadillos Are Danger- ous," Natural History, 109:86, July- August 2000)

Another unexpected habit of some armadillos is their Crossing of small streams by walking along the bottoms underwater. They can swim on the surface if they wish by gaining the necessary buoyancy by filling their intestines with air.

PROCESSIONARY SPERM

Sperm of many species are polymorphic; that is, physiologically different with different assigned tasks. Some specialize in egg penetration and fertilization, while others hunt down and destroy any sperm from competing males. Still others clump together to make copulatory plus that block sperm from subsequent capulations. (p. 106)

Now we learn that the sperm of the European wood mouse possess hooked structures on their heads that help them join up in processions of 50 to several hundred sperm. A group of long, autono- mous swimming creatures is created upon each ejaculation. With coUective, coordi- nated action, these "creatures" can swim toward the waiting egg 50-100% faster than a single, unaided sperm.

The European wood mouse is highly promiscuous. The sperm from several males may be competing in the same egg race. Loners have no chance. So, somehow hooked heads and altruistic, eollec- tive behavior have evolved.

Some evidence exists suggesting that human sperm tend to follow in each other's wakes. Marsupial sperm travel faster in side-by-side pairs. The sperm of some other species form non-linear aggregations.

(Short, Roger V.; "Do the Locomotion," Nature, 418:137, 2002. Milius, S.; "Altruistic Sperm," Science News, 162:20, 2002)

Comment. Not only do animáis evolve macroscopically on a whole-organism basis, but their component parts are likewise evolving with their own miniagendas. Even our thousands of different proteins continuously evolve. Like the animáis that carry them, they are born, "live," work, wear out, and endure injuries. Our proteins are continuously checked and, when no longer useful, they are tagged by monitoring molecules for quick dispatch by the eell execu- tioners (the proteosomes). Our bodies, therefore, contain billions of miniature life-and-death struggles.

LACTATING MALE BATS

The scene is a Malaysian forest, where scientists are sampling canopy wildllfe with nets:

> When the researchers captured a group of bats in a wide-ranging effort to survey animáis that inhabit the Malaysian canopy, they were dumbfounded to see that the eight adult male Dyaks [a species of fruit bat] in the net all had visibly swollen breaste that produced milk upon being gently squeezed.

No other wild male mammals are known to give milk, although inbred domestic male goats and sheep will—rarely— lactate. It is not known if the male bats actually nurse the young.

(Angier, Natalie; New York Times, February 24, 1994. Cr. J. Covey. Francis, Charles M., et al; "Lactation in Male Fruit Bats," Nature, 367:691, 1994. Fackelmann, K.A.; Science News, 145:148, 1994)

Comment. In their book Anomalies and Curiosities of Medicine. G.M. Gould and — - W.L. Pyle record several cases of human males lactating and even suckling infanta.

DOLPHIN REFRIGERATORS

Dolphins and other cetaceans have an overheating problem. For high hydrodynamic performance, their bodies must be nicely streamlined. For males, this means that their testicles must be stored internally. But dolphins are very active animáis, and their muscles genérate considerable heat—too much heat for sperm to survive without some sort of special cooling system. (Recall that human males with undeseended testicles may become sterile.) Since dolphins are obviously procreating, evolution must have come to the dolphins' rescue. Evo- lution's engineering solution installs heat exchangers in the dolphins' tails and dorsal ñns. Blood heated in the vicinity of the testes is pumped through special veins in the tail and dorsal fin, where it is cooled by seawater and then returned to the dolphins' heat-sensitive innards.

Female dolphins have similar heat exchangers to cool their uteri.

The same article in Discover points out still another remarkable adaptation conferred on dolphins: They-do not have to expend a lot of energy in diving to great depths. Below about 70 meters, the water pressure collapses their lungs so that they sink like rocks! Of course, returning to the surface does require some exertion.

(Zimmer, Cari; "The Dolphin Strategy," Discover, 18:72, March 1997)

Comments. One automatically supposes that the dolphin dorsal fin is needed for stabilization when swimming—like an airplane's rudder. But several cetácea do quite well without dorsal fins; viz., the finless dolphin found in Indo- Pacific waters. Could dorsal fins actually have evolved for thermal control rather than stabilization?

And how do dolphin's breathe if their lungs have collapsed? Their blood and muscles act as oxygen reservoirs— still another evolutionary adaptation.

ÜNEXPLAINED WEIGHT-GAIN TRAN- SIENTS AT THE MOMENT OF DEATH

The Journal of Scientific Exploration rarely carries articles as bizarre or as Fortean as this one. We hope the phe- nomenon can be verified because the implications are as revolutionary as, say, the discovery through the scientific method that the human soul exists!

The article's author is forthright in admitting the possibility of an equip- ment artifact or, possibly, some com- prehensible physiologieal change in their (supposedly) dead subjects.

It is asserted that twelve animáis (11 sheep, 1 goat) were studied. At the moment of death for the seven adult sheep, weight-gain transients of 18-780 grams, lasting 1-6 seconds were ob- served on an electronic scale with a sensitivity of 1 part in 20,000 and a response time of 0.2 second. No such transients were noted for the lambB or goat. There were no permanent weight changes.

Similar weight-gain transients have been observed in sleeping, dreaming humans, but these transients are unpredictable.

The article's abstract concludes with:

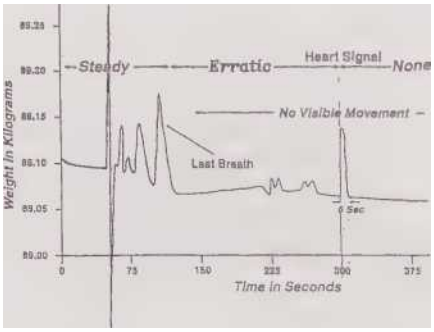
> Dynamic weight measurements may present a fruitful area of investigation.

(Hollander, Lewis E., Jr.; "Unexplained Weight Gain Transients at the Moment of Death," Journal of Scientific Exploration, 15:495, 2001)

Comment. The ancient Egyptians and others believed that when death occurred something palpable (the soul?) left the body. These departing somethings can be seen on Egyptian muráis.

It is difficult to take this business seriously. But if we can admit discussion of UFOs, ESP, and bigfoot, why not this? After all, there are hard data.

Perhaps the sheeps' lungs collapsed or some other organs moved to create the weight transients.



Weight versus time for sheep #3 near, during, and after death, What caused the death weight-transient?

ORGANS

MYSTERIODS LOSSES AND ACQUISITIONS OF COLOR VISION

The eyes of most mammals incorpórate two types of color-sensitive cones; one for seeing blue light, the other for green light. Such mammals have bichro- matic visión and discern colors rather well. Humans and the other primates are blessed with trichromatic visión, for their eyes have cones that register red light. Does this indícate evolution superiority? Hardly, birds possess five types of color-sensitive cones that sense two additional parts of the spectrum.
How and why these enhancements in color visión occurred are not weH- understood. Ñor do we know why they were restricted to mammals and birds; although it is easy to fabrícate several survival-of-the fittest scenarios. The "how" part of the mystery is particularly hard to grasp in neo-Darwinian terms because the complex pigments that confer spectral sensitivity upon the cones represent remarkable, complex Chemical syntheses.

Also mysterious is the apparent loss of color visión in 14 species of toothed whales and seáis. (Only 14 species were examined; there may be more.) These particular whales and seáis lack the blue- sensitive cones, even though they are descended from mammals with bichromatic visión (hippos and otters, respectively).

This deficiency is doubly perplexing:

(1) Sensitivity to blue light is highly desirable in the oeean environment be- cause it is blue light that penetrates seawater weU; and

(2) The loss occurred in two rnammal- ian lineages not particularly closely re- lated on the evolution charts. In other words, they were probably not random, unlucky mutations; rather, something more profound.

Neo-Darwinists are quick to explain that these afflicted species may have originally frequented shallow waters where sensitivity to blue light was not so important. This capability dwindled away like the power of sight in some blind cave creatures. It never returned.

(Chin, Gilbert, ed.; " Color-Blinaness in Whales," Science, 292:399, 2001. Hecht, Jeff; "Blind to the Big Blue," New Scientist, p. 14, April 28, 2001)

Comment. The articles just referenced do not state that the loss of blue-vision extended to the baleen whales (hump- backs, etc.), ñor was there any differen- tiation between the two major classes of seáis.

For more on the remarkable visión of birds, see our catalog Biological Anomalies: Birds.)

ATTENTION, PUPILS!

The following questions appeared in the December 11, 1999, issue of the New Scientist:

Why do some animáis have a non-circular pupil? Cats and some snakes have a vertical shape yet horses and goats have a horizontal one. What is the reason behind the differences and, more importantly, how do the different shapes affect how animáis actually see things?

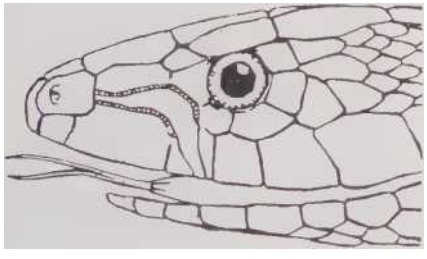
The answer for the vertical slit is that it improves an animal's focus in the direction perpendicular to the slit. Thus, cats and snakes hunting cióse to the ground can better detect their prey over a wide horizontal ñeld.

But how about the horses, goats and other grazing animáis that must keep their eyes open for predators across a wide horizon? Pupils with horizontal slits would seem to defeat this purpose. Ah, but when they lower their heads to graze, their vertical pupils become horizontal. Simple!

(Anonymous; "Eye to Eye," New Scientist, p. 85, December 11, 1999)

Comments. But puzzles remain, otherwise we wouldn't address this subjeet:

(1) Some snakes have round pupils (as in the illustration) havjng apparently been subjected to different environmen- tal forces;



Some snakes, such as grass snakes, have round pupils instead of the usual vertical slits.

(2) Of all the 9,000+ species of birds, only the skimmers own pupils with vertical slitB. You would expect ground- feeding birds such as robins and larks to also have themj and

(3) Most interesting are the cuttleñsh with pupils shaped like Ws. That's a tough one.

ACOÜSTICAL "VISION" DNDERWATER

When we (and all eyed animáis) see an object, we are detecting light reflected from that object. When underwater, though, our visión is limited because light does not travel far. Sound, how- ever, does; and sound is reflected from objects just as light is. This is of course the basis of underwater sonar, in which a sound souree replaces the sun or a diver's floodlight. But even without an active sound source, the ocean is full of sound. Waves, rain, and the sounds made by marine animáis create a back- ground of noise that "illuminates" objects, not directly, but from the en- vironment in general. Using only this enveloping background sound, it is pos- sible to create acoustical images of objects. "Vision" of this sort is equiva- lent to "facial visión" in blind humans, who can hear objects using the environ- mental sound reflected from them.

J. Potter and his colleagues at the National University of Singapore have constructed an array of underwater microphones that detects "slices" of the acoustical environment around it. When processed by a Computer, images of objects emerge by virtue of the baek- ground noise reflected from them.

This group has also estimated the ability of dolphins to detect and pro- cess background noise. They suggest that dolphins should be able to "see" objects at least 25 feet away without even using their active sonar; that is, their clicks. This passive acoustical imaging would be a useful evolutionary development because dolphin clicks warn some prey and allow them to escape.

(Anonymous; "Cacophony of the Deep," Discover, 19:19, May 1998)

Comments. Some insects can detect the sonar cries of pursuing bats and take evasive action. Perhaps some fish can detect pursuing dolphins, too.

Blind people can augment facial visión by tapping with a cañe or using a mechanical clicker.

ACOÜSTICAL PIPES IN BEAKED WHALES?

Because they are relatively rare, the comings and goings of beaked whales remain largely unrecorded. These mammals are effectively toothless for predatory purposes. In fact, some marine biologists speculate that they secure their slippery prey by suddenly vacuuming them up by actuating a pump- like tongue. (See p. 120.)

But how do the beaked whales flnd their prey in the first place? With their sonar, of course. But these superbly streamlined animáis lack the huge exter- nal ears of the sonar-using bats. How do they detect the weak echoes bouncing off fleeing fish?

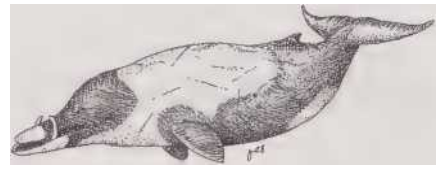
P. Zioupos and J. Currey, at the University of York, have drawn attention to the rostrum bone that forras the beak- like upper jaw of Blaineville's beaked whale. At 2.7 grams/cubic centimeter, this bone is 50i denser than the average mammalian bone.

The bone also turned out to have unique Chemical properties. It con- tains 35 per cent calcium by weight ----13 per cent more than the highest valué known previously. Using microscopes, the team showed that the bone is riddled with tinv tunnels. containing highly concentrated minerals.

The channelled nature of this bone make it very brittle, making it unlikely that it is used as a ram in mating bouts. Zioupos and Currey propose that this uniquely structured bone is really an acoustical pipe for the beaked whales' sonar signáis,

(Barnett, Adrián; "Do Whales Talk through Brittle Beaks?" New Scientist, p. 20, May 10, 1997.)

Comment. Acoustical pipes were also invented by cióse relatives of the beaked whales, the dolphins. With the dolphins, it is the lower jaw that has been converted into a "sound pipe" for receiving sonar echoes. Dugongs, too, possess squamosal bones filled with oil that are probably also connected with sound de- tection. Evolution has been highly innova- tive—three times, in different ways— in designing acoustical pipes in marine mammals! This is very impressive for a method that begins with a random procese.



The strap-toothed whale is one of the beaked whales. The curved teeth of this male prevent it from opening its mouth more than a couple inches. Blaineville's beaked whale, on the other hand, possesseS two large, leaf-shaped teeth that project upward and forward. These two grotesque teeth are often covered with barnacles. The teeth of neither whale are of much use in procuring medís. They are "suckers," as mentioned on p. 120.

STRAIGHT FROM THE HORSE'S EAR

Vets at the Animal Health Trust in New Market, UK, had just removed a tumor from the lip of a 5-year-old Welsh pony, when they heard a strange, high-pitched hum emanating from its right ear. The hum was surprisingly loud and quite obvious to the surgical team standing a meter away. The hum's pitch was a steady 7 kilohertz.

E. Douek, an ear, nose and throat surgeon, stated that audible sound coming from ears is extremely rare.
Such sounds are usually caused by mus- ele spasms in the inner ear or throat, or by resonance due to abnormalities in the ear's blood supply.

(Bonner, John; "Humming Horse Puzzles Vets," New Scientist, p. 5, April 29, 1995)

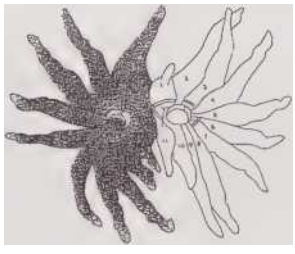
Comment. This is not the first time we have heard about humming ears. (p. 109) In vol. 1, p. 125, H. Zuccarelli theo- rized that human ears normally emit a faint reference sound, which mixes with incoming sound to form an interference pattern inside the ear. The resulting

"acoustic holagrams" allow humans and some other primates to lócate the souree of a sound without turning their heads. The afflietion called "tinnitus" is evi- dently not involved.

THE STAR OF THE STAR-NOSED MOLE

The star-nosed mole is one of North America's more bizarre mammals. Its nostrils are surrounded by mobile, Medusa-like appendages that are richly suppled with nerves and blood vessels. These tentacle-like structures forra the "star," which has long been considered a tactile organ used for feeling for prey. However, behavioral experimenta by E. Gould et al indicate that the star may be more than a tactile organ. It seems to sport electrical sensors that detect the minute electrical fields surrounding worms, leeches, insect larvae, and other favorite mole tidbits. This conclusión derives from experiments in which star- nosed moles preferentially attacked the parts of worms that are most strongly electrical.

Actually, scientists have been puzzled as to how this mole found its prey, for this mammal is semiaquatic and somehow locates its dinner in muddy water even though it has poor eyesight. Although some fish possess electrical sensors, they are uncommon in mammals.



(Left) Tentacle-like rays surrounding the nostril of the star-nosed mole.
(Right) The numbers inside the rays around the other nostril are proportional lo the density of the sensory receptors.

Half way around the planet, another strange creature, also classiñed with the mammals, frequents muddy waters looking for the same sort of prey favored by the star-nosed mole. The Australian platypus also has weak visión and em- ploys search techniques similar to those of the mole. Instead of sensor-bearing tentacles on its prow, the platypus has a duck-like bilí loaded with electrical sensors.

(Gould, Edwin, et al; "Function of the Star in the Star-Nosed Mole, Condylura Crista," Journal of Mammaloev, 74:108. 1993)

Comment. Curious, isn't it. that such distantly related animáis evolve similar organs and hunting strategies when con- fronted with like environments? This is called "parallel evolution;" but naming the process does not tell us how nature accomplishes it. Chance mutations and natural selection? Theoretically possible, but not always convincing. Nature must still be withholding some secret from us!

CHEMICAL REACTIONS

THE URGE TO REPLICATE

In vol. 1, p. 135, we related how the morphology of the megabats (often caUed "flying foxes") displays some primate overtones. The very idea that bats of any kind could be closely related to humans and apes was quickly dismissed by most zoologists. Flying mammals the bats—evolved only once according to mainstream theory; later the Order Chiroptera ("hand-wings") split into the small, mainly inseet-eating microbats and the large, fruit-eating megabats. It was all pretty obvious; how could such com- plex, specialized animáis have evolved twice?

But in Science Frontiers, there is ever the "however":

> Arnd Schreiber, Doris Erker and Klausdieter Bauer of the University of Heidelberg have looked at the pro- teins in the blood serum of megabats and primates and found enough in common to suggest a cióse taxonomic relationship between the two groups. (Biological Journal of the Linnean Society, 51:359)

An explanation might be that the similarities between the microbats and megabats represent adaptations to similar environmental niches rather than a common ancestry.

(Timson, John; "Did Bats Evolve Twice in History?" New Scientist, p. 16, June 4, 1994)

Comment. Does the black box labelled EVOLUTION contain a special subprogram for converting hands into membaneous wings whenever it seems profitable to do so? Or are we somehow missing a different sort of evolutionary process, perhaps something akin to the "directed evolution" suggested by some experiments with bacteria? (vol. 1, p. 180)

THE LETHAL SLOW LORIS

The slow loris, a cute, cuddly primate of southeast Asia, is one of those rare mammals with a toxic bite. A gland on its arm secretes a mixture of proteins that is lethal to some humans. This potential poison is tranBferred to the loris[1] mouth when it licks the gland while grooming itself.

(Anonymous; "Lethal Loris," New Scien- tist, p. 20, February 15, 2003)

Comment. We now add the slow loris to our very short list of poisonous mammals: some shrews, some solenodons, and the platypus. (See our catalog Biological Anomalles: Mammals II.)

Actually, a deep bite from a feHow human should not be trifled with because the human mouth is heme to over 100 species of bacteria—some of them not so nice.

The bite of the slow loris can be lethal to some humans.

TALENTS AND FACULTIES

BLINDSIGHT ALSO OCCURS IN MONKEYS

Blindsight is an eerie phenomenon. Humans with cortical blindness; that is, they have lost their primary visual cor- tex through brain damage or disease; can still detect objects and yet be unaware of them. Doesn't sound right, does it? The situation is this: A person, apparently totally blind, can somehow discern the location, form, and size of objects, but they wül swear that they "see" nothing at all. In fact, they are blind by aU tests. They have blindsight.

One explanation of blindsight main- tains that the visual cortex has not been totaHy destroyed, and that fune- tional remnants remain. In scientific terms, blindsight representa "suboptimal functioning of the primary visual cortex."

But now, A. Cowey and P. Stoerig report that they have totaHy removed the primary visual cortex from monkeys' brains. (Something one would not try with humans!) Tests with the visual cortex-less monkeys demonstrated that they possessed blindsight. Therefore, blindsight does not seem to be "suboptimal functioning" of a damaged brain —at least in monkeys.

Blindsight thus remains a mysterious biological function. How do blindsighted humans detect objects of which they are not visuaUy aware? Somehow information about the visual world appears in the brain.

(Cowey, Alan, and Stoerig, Petra; "Blindsight in Monkeys," Nature, 373: 247, 1995. Also: Kaas, Jon H.; "Vision without Awareness," Nature, 373-195, 1995)

TELESTOMPING ELEPHANTS

Elephants, rhinos, okapis, and even some birds use infrasound (frequencies below 20 Hertz) for comraunication. At a recent meeting of the American Acousti- cal Society, üniversity of California researchers reported that elephants also send low-frequency acoustical signáis by stomping the ground. Almost inaudible to humans in the air, the sounds travel through the ground and can be picked ᵘP by ground microphones. It is thought that this eommunication channel has a range of as mueh as 50 kilometers------far greater than the sounds could be per- ceived in the air.

Supporting this notion, anecdotes relate that elephants somehow know when other elephants are being killed far, far away. They then run in the opposite direction! But how do they detect the stomping sounds if they travel through the ground?

(Anonymous; "Stomping Ground," New Scientist, p. 25, December 13, 1997)

MAPPING WITH A SONG

The songs of the humpbaek whale are complex and eerily melodic. Only the male humpbacks sing, and then only during the mating season. In contrast, the songs of blue whales are exceedingly dull. They consist of only five notes repeated in various combinations. Since both sexes sing most of the year, the songs of the blue whale probably have nothing to do with reproduction. Then, why do they sing?

A clue to the purpose of the blue whales' songs is found in their precisión timing. One note is sung every 128 seconds. Furthermore, these notes (sound pulses) carry for hundreds of kilometers. C. Clark, a Cornell scientist, believes these notes are really sonar pulses used for fixing a whale's loeation. Echoes returned from distant seamounts, continental shelves, and other undersea topography enable the whales to map their positions within the wide ocean basins as they wander far and wide.

(Hecht, Jeff; "Rhythm of Blues Charts the Ocean Depths," New Scientist, p. 19, June 20, 1998)

Comment. Short-range sonar is widely used by bats, Oilbirds, Edible-nest Swifts, and, of course, dolphins. As far as we know, the blue whale is the only animal employing sonar for long- range mapping. However, some birds seem to use distant infrasound sources (ocean surf, wind flowing over mountain ranges, etc.) as erude beacons during migration.

WHAT SANG FIRST?

Not WHO, but WHAT! Sophisticated music predates the advent of modern humans by tens or hundreds of million years. Whales and birds filled the ocean and primeval forest with song long before our hominid branch sprouted on the Tree of Life. As a matter of fact, our closest relatives, the great apes, sing not at all. Somewhere in the hominid genome "music" genes reside, unexpressed in the apes, but somehow triggered into activity in the human line.

We have learned recently that the Neanderthals manufactured bone ñutes as far back at 53,000 years. They may not have been able to speak to one another in words, but they had the language of music. Their music, and ours, may have been entrained in genes inherited from nonhominid ancestors that lived 60 million years ago, but which have been suppressed in primates until Neanderthals and modern humans carne along.

You may wonder where this argument is taking you. It goes back at least 60 million years to when the cetácea (whales and dolphins) split off from the evolu- tionary track leading to humans. It may even go back farther to when birds split away from the reptilian line. The music of birds and whales incorpórate some of the complexity and sophistication of Beethoven's Fifth.

The genes that have led to such musical talents may be ancient indeed, as speculated in the Science article under review. The authors go so far as to ask:

> **Do musical sounds in nature reveal a profound bond between all living things?**

Such profundity requires some factual support, and the Science article compares human and whale music in some detail.

- **Humpbaek rhythms are similar to ours.**
- **Humpbacks use phases similar in length to human music. They also create themes out of the phrases.**
- **Whale songs have lengths between those of a human bailad and a symphony movement, suggesting a similar attention span.**
- **Some whale songs are similar in structure to human compositions.**
- **The tone and timbre of many whale notes are similar to human musical sounds.**
- **Humpbaek songs contain repeating phrases that form rhymes, again this is similar to human music.**

The list paraphrased in part above, in which the word "similar" is repeated again and again, is longer; but the point is adequately made that the genes that lead to whale music may be the same ones we have inherited but which are only now being expressed.

(Gray, Patricia M., et al; "The Music of Nature and the Nature of Music," Science, 291:52, 2001)

Comment. Many questions arise after reading the above article. Two will have to suffíce here. First, music is so complex, sophisticated, and packed with information compared to the grunts and squeaks that suffice for many animáis that we have to ask: What evolutionary imperatives required its emergence? Second, and equivalently, why and how did humans, whales, and birds evolve the diverse, specialized physiological apparatuses that produce music?

HORSE SENSE?

Writing to Weather in conneeñon with an earlier letter regarding the possible stalling of a car due to lightning (p. 220), P.F.. Borrows recounted a pertinent incident involving horses and lightning:

> **I was driving from Aylesbury to High Wycombe via Hampden during a thunderstorm. On an open hillside to the north of the valley, two horses were quietly grazing when suddenly, for no obvious reason, they bolted to the far end of the field. Within about 15 seconds of them moving, there was a lightning strike at the point where they had been standing. How interesting to refleet that more modern means of transport may also be able to detect the highly charged atmospheric State, but appear to be immobilised rather than spurred to self-preservation.**

(Borrows, P.F.; "Horses Bolt, Spurred by Lightning," Weather, 48:161, 1993)

SKELETAL EVIDENCE

LATE SÜRVIVAL OF MAMMOTHS

Many a sensational article has been writ- ten about how the Siberian mammoth population was deep-frozen by a sud- den climate change due to a shift in the earth's poles or some other catastrophic event circa 10,000 years ago. But now, Russian scientist A. Sher and two col- leagues claim that a dwarf versión of the wooly mammoth survived on Wrangel Island, 120 miles off the Siberian eoast until about 3,700 years ago.

The Wrangel Island dwarf mammoths stood only about 2 meters high and weighed 2 tons. The British mammoth expert, A. Lister, said he was not really surprised at this discovery, be- cause many islands supported dwarf versions of mainland animáis during the Ice Ages.

(Crenson, Matt; "A Mammoth Discovery," Dallas Morning News, p. 22A, March 25, 1993. Cr. L. Anderson. Bower, B.; "'Dwarf[1] Mammoths Outlived Last Ice Age," Science News, 143:197, 1993)

Comment 1. If the full-size Siberian mammoths really met their demise be- cause of a catastrophic climate change, how did the dwarf mammoths occupying the same región escape?

Comment 2. Lister's remark about other dwarf island inhabitants brings to mind the dwarf elephants of Santa Rosa, off the Californian coast, which may have the main course in early human feasts. But, curiously, island isolation also leads to gigantism, as seen in the moas of New Zealand. This contradiction needs explaining.

TUBERCULOSIS AND THE EXTINCTION OF THE MEGAFAUNA

It is customary to blame overkill by human hunters for the demise of the mastodon—especially those invaders of North America surging across the Bering Land Bridge as the lee Age waned. But disease may have also played a role.

> Hyperdisease—an epidemic that sweeps through an entire species'— has for years been theorized as a factor that led to the extinction of Ice Age giants like mammoth, mastodon, and ground sloth. The theory has now been reinforced by powerful evidence. Bruce Rothschild has dis- covered that at one time probably the entire population of mastodon was infected with tuberculosis.

Rothschild has found many mastodon bones bearing lesions typical of tuber- culosis .

CAnonymous; ''Tuberculosis Found in Mastodon Malees the Case for Hyperdis- ease in Megafauna," Mammoth Trumpet, 18:1-, September 2003.)

POLAR-BEAR BONES CONFOUND ICE- AGE PROPONENTS

Given the unquestioning fealty accorded the Ice Ages, it is not especially odd that the Information reported below has not received wider circulation.

In 1991, construction workers at Tysfjord, Norway, 125 miles north of the Arctic Circle, accidentally dug up polar-bear bones that were later radio- metrically dated as at least 42,000 years oíd, probably 60,000. R. Lie, a zoologist at the University of Bergen, and other scientists subsequently found the bones of two more polar bears in the area. These were dated as about 20,000 years oíd. An associated wolf's jaw was pegged at 32,000 years.

The problem is that Norway and many other northern circumpolar lands are believed to have been buried under a thick ice cap during the Ice Ages. In particular, northern Norway is thought to haVe been solidly encased in ice from 80,000 to 10,000 years ago. Polar bears could not have made a living there during this period. Clearly, something is wrong somewhere.

(Anonymous; "Polar Bear Bones Cast Doubt on Ice Age Beliefs," Colorado Springs Gazette, August 23, 1993. An Associated Press dispatch. Cr. S. Parker, COUD-1)

An associated conundrum. Some authori- ties have stated that polar bears evol- ved recently—only 10,000 years ago!

A REALLY ERRANT SEAL

Deep in the frozen wastes of Antárctica, at an altitude of 1,300 meters [about 4,000 feet], B. Lytskiold carne across a dead seal. The nearest coastline was 250 kilometers away.

(Anonymous; "Seal That Went Walkabout," New Scientist, p. 11, January 15, 1994)

Comment. Actually, many such "mummi fied" seáis have been found high in the Antarctic mountains far, far from water. They are usually crabeater seáis. No one knows why they head inland to cer- tain death.

Additional observations of wayward Antarctic seáis may be found in our catalog volume: Biological Anomalies: Mammals II.

UNRECOGNIZED SPECIES

IS CADDY A MAMMAL?

"Caddy" is short for Cadborosaurus, the speculative sea animal seen rather frequently off the British Columbia coast and as far south as Oregon. Pro- fessor P. LeBlond, University of British Columbia, recently presented a paper on Caddy at a joint meeting of the Canadian and American Societies of Zo- ology. Of all the supposed sea serpents, Caddy seems closest to respectability. Not only are there many sightings on record, but the remains of a 3-meter- long careass of an apparent juvenile specimen of Caddy was discovered in the stomach of a sperm whale. Adult Caddys are about 7 meters long.

> The descriptions [of Caddy] are generally similar. They suggest a long-necked beast with short pointed front flippers, a horse-like head, distinct eyes, a visible mouth and either ears or giraffe-like horns. Often Caddy is described as having hair like a seal, and sometimes a mane along its neck.

Most interesting is Caddy's body hair, which implies a mammal rather than a reptile. But if it is a mammal, how does it get air, since it surfaces so rarely? Some have suggested that the giraffe-like horns are snorkels!
But E. Bousfield, a colleague of LeBlond, thinks that the tubercules reported along the animal's back might be gill-like tissues that would allow a mam- mal to extract oxygen from seawaterí With so little hard evidence, specula- tion can get pretty wild.

(Park, Penny; "Beast from the Deep Puzzles Zoologists," New Scientist, p. 16, January 23, 1993)

POSSIBLE SURVIVAL OF GIANT SLOTHS IN SOUTH AMERICA

For many years, rumors have been fíl- tering out of trackless western Amazonia telling of a 6-foot, 500-pound giant sloth clothed in reddish hair. Rubber gatherers of the región report that this fearsome creature emits a hide- ous odor and transfixes one with a para- lyzing stare! It also seems impervious to spears and shotgun pellets. Natives and some cryptozoologists equate this animal to the legendary Mapinguari.

D.C. Owen, an American biologist working with the Goeldi Natural History Museum in Belem, Brazil, has been tracking these stories. The present fos- sil record asserts that giant ground sloths resembling the supposed Mapinguari did occupy western Amazonia up to about 8700 years ago. To this must be added the appearance of an apparent- ly fresh skin of the animal in 1897. Even more recently, gold miners are said to have killed a giant sloth. As with the North American Bigfoot, hard data are elusive, particularly actual speci- mens, dead or alive.

Owen is optimistic, however. He sees his hunt for the Mapinguari as more than just another useless monster hunt:

> If South America's largest terrestrial mammal has been hidden to Science until 1994, what else does the Ama- zon have in terms of biodiversity that's new to us?

(Stolzenberg, William; "Bigfoot of the Amazon," Nature Conservancy, p. 7, July/August 1994. Anonymous; "The Mother of All Sloths," Fortean Times, no. 77, p. 17, October/November 1994)

Comment. Where is the 1897 skin? What happened to the sloth killed by .the gold miners? Cryptozoology has always been plagued by disappearing critical evidence!

P.J. Wynne's impréssion of South America's reported late-surviving giant ground sloth.

LATE SURVIVAL OF THE KILOPILOPITSO AND KIDOKY

Cryptozoological articles are rare in the mainstream Science literature, but a 1999 number of the American Anthropologist has surprised us with an investigation of two mystery mammals on Madagascar.

In 1995, D.A. Burney and Ramilisonia interviewed elderly natives about their knowledge of the Kilopilopitsofy and

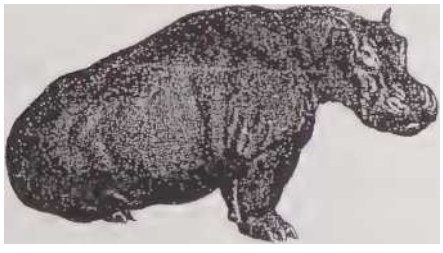
Kidoky. Both of these anímala are iren- tioned in the historical aceounts £ind folklore of Madagascar between the mid-1600s and late 1800s. The testimonies collected by Burney and Ramilisonia enabled them to provide tentative indentifications of these two mystery animáis, both of which may still survive today.

The Kilopilopitsofy

> A striking feature of the aceounts of this mysterious animal is the consis- tency of the details. A11 the aceounts we have collected stress that the animal is nocturnal, grunts noisily, and flees to water when disturbed. Like- wise, there is general agreement that it is cow-sized, hornless, dark in color, and has a large mouth with big teeth.

These data agree with the oíd descrip- tions of the mangarsahoc (1661), the tsy-aomby-aomby (1882), and the Omby- rano (1912). One animal ñts all of these aceounts: the dwarf hippopotamus (Hippo- potamus lemerlie, supposedly extinct for over 1,000 years.

■



Whaí the kilopilopitsofy probably looícs like—a hippo!

The Kidoky .

> This animal's description is decidedly lemur-like. It was compared to the sifaka by all the interviewees who described it, although all insisted that it was not the same animal... It is much larger.. .perhaps 25 kg. It is usually encountered on the ground and may flee on the ground rather than taking to the trees... Its whooping cali is suggestive of an indri.

The Kidoky is probably the giant aboreal lémur (Palaeopropithecus), known only from subfossils 1,000 or more years oíd.

(Burney, David A., and Ramilisonia; "The Kilopilopitsofy, Kidoky, and Boky- boky: Aceounts of Strange Animáis from Belo-sur-mer, Madagascar, and the Mega- faunal 'Extinction Window'," American Anthropologist, 100:957, 1999)

Comment. The Bokyboky mentioned in the article's title definitely does survive under the ñame: Malagsay Narrow-Striped Mongoose. Reference: Walker's Mammals of the World.

INTERSPECIES PHENOMENA

DOG DOCTORS

Credentials must be established here. The writer of the two articles digested below is an M.D. and a gradúate of the Harvard Medical School. This is not a hoax!

Melanoma sniffíng. In 1989, the Lancet, a respected British medical journal, pub- lished an article relating how a female dog, half border collie, half doberman, sniffed out a spot of melanoma on a woman. In fact, the dog ignored all of the other moles on the woman and even tried to bite off the melanoma.

Melanoma is the most dreaded form of skin cáncer, so this bizarre report stimu- lated A. Cognetta, an American dermo- tologist, to try an experiment. First, another dog, named George, was trained to find tubes containing melanoma sam- ples, which he did correctly 99% of the time. Next, a human with active melanoma was enlisted. Severa! bandages were placed on the subject's body in- cluding one over the melanoma site.
Once again, George was almost 100% accurate in his diagnosis. Subsequently, George suecessfully identified malignan- cies on other patients.

(Walker, Kenneth; "George the Dog Helps Take a Bite out of Skin Cáncer," Chicago Sun-Times, September 6, 1998. Cr. J. Cieciel)

Seizure sniffíng. An English woman sub- ject to epileptic seizures never goes any- where without her dog Rupert. Rupert has a nose for the odor that precedes epileptic seizures in humans. He barks about 40 minutes before the actual seizure, giving the woman a chance to get to a safe place. Of course, Rupert barks at other things, too, but his seizure bark is noticeably different.

(Walker, Kenneth; "Mutt Gives Epileptic Advance Warning on Seizures," Chicago Sun-Times, September 13, 1998. Cr. J. Cieciel)

Comment. Actually, several medical cón- ditions (gout) and diseases (cholera) have odors detectable by humans.

MALE DOLPHIN KILLS MAN

Male dolphins definitely prefer human females. In fact, a recent incident at a Sao Paulo, Brazil, beach reveáis an antagonism toward human males. A wild, resident male dolphin, noted for his friendliness toward women swimmers, attacked two human males, who were evidently considered to be romantic competitors. One of the men died from internal hemorrhaging after being but- ted by the dolphin. The other man re- ceived a broken rib.

(Anonymous; "Dolphin Prefers Women, Kills Male Playmate," Washington Times, December 11, 1994. Cr. S. Parker, COUD-1)

Comment. Obviously, dolphins are not always as friendly as Flipper. In fact, a recent TV documentary related how a female snorkler was seized (gently) by a male false killer whale (a type of dolphin) and dragged down 100 feet before being released unhurt though nearly drowned.

THE DARK SIDE OF BLACK CATS

Folklore assures us that black cats are bad luck. There may be something to this notion—at least for some people.

> Shahzad Hussain and his colleagues at the Long Island College Hospital in New York gave a questionnaire to 321 allergy sufferers asking them to de- scribe their cats and assess the severity of their symptoms. Those with dark cats were four times as likely 1o have severe symptoms as people with light-coloured cats. "We were surprised," says Hussain. "So many questions need to be answered."

(Anonymous; "The Dark Side of Black Cats," New Scientist, p. 27, November 4, 2000)

BIRDS

EXTERNAL APPEARANCE

MORDER IN THE NEST

In a recent issue of BioScience, R.B. Payne authored an excellent review of brood parasitisra in birds. Brood parasites lay their eggs in the nests of other species, which then incúbate the ' eggs and raise the alien chicks. The parent parasites are thus free to forage, hang out, and parasitize more nests. Brood parasitism is such a successful and easy way of Ufe that 136 species of cuckoos, 5 species of cowbirds, 20 finches, and South America's Black-headed Duck have adopted it.

Brood parasitism fascinates ornitho- __ logists because it involves war between the parasites and their hosts. Since host species may eject parasite eggs or fail to nurture parasite chicks, brood parasites have evolved mimicry as a powerful weapon in these battles.

Mimicked are host eggs, host nestlings, and host vocaüzations. But the most insidious weapons of all involve the out- right murder of host chicks. To this end, parasite chicks have evolved some speeial weapons and behaviors.

Some cuckoo chicks evict host eggs or chicks by squirming under thein and positioning them in a specially eonfigured hollow on their backs. Then, pushing upward and outward to the rim of the nest, they dump their cargo over the edge.

Eurasian cuckoo chicks maneuver under host eggs and chicks and dump them over the edge of the nest. Their backs have a specially designed hollow that iust fits their potentiál competitars. It is this specialized morphology that sug- gests classifying this ítem under "Ex- rernal Appearance. " We reintroduce the subject of brood parasitism under "Be- havior" on p. 131. (There is much more in our catalog: Biological Anomaliesi Birds)

Other brood parasites are more direct and bloodthirsty.

> Nestüng African honeyguides have bilí hooks to stab and kill their nest- mates and the brood parasitic American striped cuckoos have indepen- •dently evolved hooks and pincers to kill.

(Payne, Robert B.; "Brood Parasitism in Birds: Strangers in the Nest," BioScience, 48:377, 1998)

Comment. The hoUow in the cuckoo's back and the deadly hook on the honey- guide bilí disappear once their grisly work is done. Both strategies require bizarre, coordinated innovations in both weapons and behavior. These could, in principie at least, be the work of random
mutation and natural selection----but were they? Is there something we are missing in our theories?

THE MYSTERIOÜS FIRST GREEN EGG

In the next Ítem, we address the subject of birds' eggs as signáis. A relevant case of "egg signalling" occurs on the Antipodes Islands 500 miles southeast of New Zealand. There, five species of erect-crested penguins breed. These birds normaUy lay two eggs but raise only one chick. The first egg is dis- tinctly greenish and much smaUer than the second white egg. The Uttle greenish egg is totally neglected and often ejected from the nest. No one knows why.

(Davis, Lloyd Spencer; "A Superlative Penguin," Natural History, 110:46, November 2001)

Comment. We suppose the first little egg could be a trial run of the female's re- productivo machinery. Its small size and subsequent neglect seem to indícate that it is not a "back-up" egg in case the second egg is defective or eaten by a predator. Or maybe the little egg is a sop to predators wlth a hope that they will be satisfied with it. It would be interesting to know if the first eggs are ever hatched and what sort of chicks emerge.

BIRD'S EGGS AS INFORMATION CARRIERS

Bird communication may be more subtle than trills and squawks. Take, for ex- ample, the observation that the last egg laid by several species ís distinctly lighter in color than the others in the clutch. This late-egg phenomenon is seen • in the sparrows especiaUy (House, Tree, Dead Sea, Grey-Head, and others).

Common Terns, Fieldfares, Herring Gulls, and Moorhens also lay palé last eggs. Since the changes in the egg production fine exact a cost in the females, there might be an adaptive explanation for the phenomenon; that is, the final paler egg may lead to increased survival of the participating species.

To illustrate, in 1980, Yom-Tov suggested that:

> ...this last odd egg might have evolved as a signal to potentiál brood parasites that the female has finished laying the clutch and has begun incu- bation. If a parasite lays its egg after incubation has commenced, then it would be unUkely to hatch, henee the potentiál parasite would benefit from heeding such a warning signal, if it could then find an alternative host nest where incubation had yet to commence. The signaling host would also benefit from avoiding the costs of warming an extra egg [the parasite's] for some of the incubation period, costs that can be considerable, as well as the possible cost of having to rear an extra chick.

G. D. Ruxton et al have used game theory to show that Yom-Tov's specula- tion has considerable merit.

However, there are nonadaptive explanations. The females in the species that lay palé last eggs may simply run out of egg pigment, or they may change physiologicaUy as the egg-laying phase nears its end.

(Ruxton, G.D., et al; "Are Unusually Colored Eggs a Signal to Potentiál Con- specific Brood Parasites?" American NaturaUst, 157:451, 2001)

Comment. We wiU not quarrel with game theory but hasten to point out that the evolution of interspecies signalling requires:

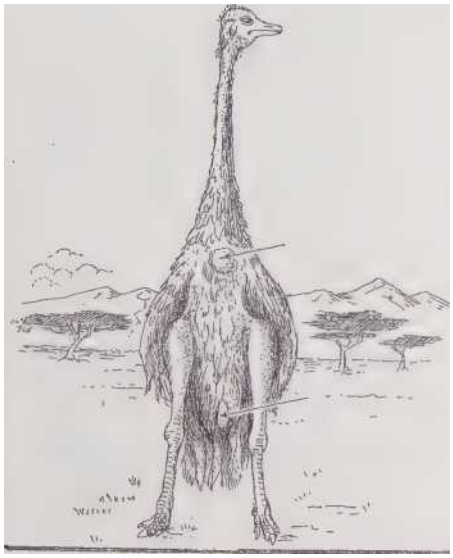
(1) A population of hosts in which some females, for one reason or other, lay palé last eggs; and

(2) A population of parasites in which, for one reason or another, some individuáis have an aversión to laying eggs in nests with a palé egg. It takes two to signal!

A STATEMENT WE NEVER THODGHT WE'D SEE

At least not in a prominent mainstream biological magazine. The surprising declaration is the second sentence in a caption of a photograph showing an ostrich chick just emerged from its Shell.

> Calluses usually form only when external abrasión turns on the right genes, but ostriches hatch with calluses on their abdomens and chests. Evolution can "genetically assimilate" an environmentally induced trait.



(Dusheck, dennia-, "The Interpretaron of Genes," Natural Historv, 111:52. October 2002.)

Comments. To us, the second sentence is puré Lamarckism; that is, acquired traits can be transmitted to progeny.

We have no idea exactly how skin abrasión and pressure on the bones can be transmitted to the genes and thereby turned into inheritable calluses and also the specially modified bone structure under them in the case of the ostrich.

The two arrows indícate the prominent callosities on the Ostrich. The bone structure under the callosities is also modified. These apparently acquired characteristics have somehow been incorporated into the Ostrich penóme.

BEHAVIOR

Birds constantly interact with us humans and our infrastructure. The past decade of collecting avian anomalies and curiosities has brought together such a large number of fascinating bird-human contacts that we have been able to divide them into four distinct categories.

•Practical use of human infrastructure. Riding the rails!

•Playing with human infrastructure. The use of stones for various curious purposes; activating automatic doors.

•Attacking human infrastructure. Automobiles, especially; virtuaiiy anything in sight.

•Miscellaneous odd behavior. Toppling at the sight be!); paying cash for their food.

PRACTICAL USE OF HUMAN INFRASTRUCTURE

PASSENGER PIGEONS NOT EXTINCT!

The English science magazine New Scientist has received numerous letters from persons confirming this assertion. For example, J. Howlett wrote:

> **In my experience, the sight of pigeons hitching a lift on the under- ground is nothing unusual. I too have often travelled from Paddington, westwards in my case-----not in frequently in the company of a pigeon, sometimes even two.**
>
> **It raises fascinating questions. Do they just fly across the line and get the next train back? How many round trips a day do they make? Do they decide in advance how far to travel? Do they study the timetables?**

(Howlett, Jack, et al; "Passenger Pigeons," New Scientist, p. 66, Septem- ber 30, 1995)

Comment. Birds frequently alight on ships at sea and even ride on the backs of animáis, but these subway pigeons seem to be more than opportunistic! The habit seems to be catching on elsewhere. See next Ítem.

PASSENGER PIGEONS IN NEW YORK

Back in 1995 (above), we described how London pigeons rodé the city's subway ("underground") from one station to another. The London pigeons may have just been lazy and traveled the under- ground intentionally, or possibly they were just inquisitive and got trapped aboard by the sliding doors. We'll never know!

Now we find that New York pigeons have somehow learned about the exploits of their London cousins. Perhaps the knowledge carne across the Atlantic via avian telepathy. Or the adventuresome London birds might have brought this new knowledge to New York by stowing away on ships. It is impossible to tell, because New York and London pigeons look the same, for they are all the same species: Rock Doves, according to the ornithologists. Of course, if the multi- tudinous pigeons in other big cities be- gin riding their subways, we may opt for "independent invention" as the best explanation for this truly amazing phenomenon of nature.

Be that as it may, the New York pigeons have also discovered that subway cars are rich food sources, where prized pizza crusts are especially abundant. The sparrows and sea gulls that also frequent the above-ground stops out on Long Island also see the pizza crusts but fear to cross the car thresholds. Obviously, these birds are not as highly evolved as the pigeons. This extra pigeon intelli- gence can also be seen in another aspeet of their behavior.

> **On the subject of evolution, Sarah Canty., another [subway-car] cleaner, said she had noticed that the pigeons might be evolving into more alert straphangers. "When the bell goes off, you watch them," she said. "They know the bell like we do." And indeed, when the next bell rang, signaling that a train was about to depart, several pigeons could be seen high-stepping it out of the train.**

of airplanes (may-

(Kennedy, Randy; "Waiting for a Train, the ¡Bophisticated Pigeon," New York Times, March 5, 2002. Cr. D. Phelps and M. Piechota)

Comment. Note the reversal of the usual animal-psychology experiment. Instead of the bell stimulating an action that will be rewarded by food, the subway bell produces action in which available food has to be abandoned!

PLAY1NG WITH HUMAN INFRASTRUCTURE

SPARROWS AT PLAY

While looking through the ornithological literature for avian anomalies recently, we found an irresistible ítem that bears on that deeply profound bit on "Crow Woes" appearing on p. 130. Remember how the Yokohama crows placed stones on the train tracks and dropped others on houses? Well, this stone-dropping must have some adaptive valué in the

evolution of birds, because sparrows have aleo inherited the trait. E.C. Jaeger recounted this anecdote in a 1951 number of The Condor:

> During my high school days at West Point, Nebraska, my father was a merchant occupying a building of two stories with a long pebble-covered, tarred roof sloping to the rear. Form- ing a short walkway behind the rear entrance were two sloping doors, which, when opened up, admitted en- try to the basement stairway. Over a period of several days in mid-May of 1903, I noticed many small pebbles scattered about on these doors. I also heard from time to time the sound of small objects falling on the doors. Efforts to find the pebble-droppers were of no avail until one day when I happened to approaoh the rear of the building from the alley. My posi- tion some ñfty feet from the building now permitted me to see several House Sparrows (Passer domesticus) bringing small stones to the edge of the roof and dropping them. As each • pebble was dropped the bird involved turned its head to one side, apparent- ly the better to listen to it and watch it as it struck the door. It may have been a sort of bird pastime; it certainly was an activity of no evi- dent valué.

(Jaeger, Edmund; "Pebble-Dropping by House Sparrows," The Condor, 53:207, 1951)

RAVENS AT PLAY

The above ítem concerning sparrows dropping stones for fun brought the following communication from N. Sager:

> In late March or early April of last year [1996], two friends and I were returning home to Kotzebue, Alaska, on our snowmobiles. We were traveling north on the frozen surface of the Chuchi Sea, when we carne upon a large number of ravens playing in the thermal updrafts at a series of low (30-80 feet) cliffs about six miles south of town.
>
> The ravens were putting on quite a show. We watehed them for about 30-45 minutes. Our attention had been caught first by their ñumbers; you seldom see so many ravens in one spot around here, and, secondly, by the fact that they were obviously playing and really seemed to be en- joying themselves. First, we noted several of them who would catch an updraft and then flip over and fly upside down! After doing this for a while, one would flip upside down and a second would fly above him and grasp talons. They would then ñy a short distance as a pair!
>
> Several of them were having a great time bombing each other with frozen elods of mud. Some of the birds would try to catch the elods .as they were dropped by others, but I didn't see any succeed. When they finally noticed us----we were about 80-100 yards off watching through binoculars and rifle scopes-----they started bombing us. When they finally got our range we left, thanking our heavy beaver-skin hats for warding off the frozen mud.

(Sager, Neal; personal communication, February 29, 1997.)

Comment. This obvious example of play among birds runs counter the position of many behaviorists that birds never play. Avian behavior that seems to be play is anthropomorphic interpretation, they say. We fail to see how the ravens described by Sager were behaving like automatons controlled only by instinct.

ATTACKING HUMAN INFRASTRUCTURE

CASSOWARY, 1; AUTOMOBILE, 0

Many birds are done in by fast-moving cars. The usual avian mode of retaliation involves defecation, especially on freshly washed and polished automobiles. On occasion, though, birds will use brute forcé. For example, keas (New Zealand parrots) consider it their duty to pry out the rubber gaskets around auto- mobile windshields with their powerful bilis.

A cassowary can be even more force- ful. Recently, a motorist near Cairas, Australia, was forced to stop by a six- foot cassowary standing in the middle of the road. He edged the car forward slowly, but the huge bird stood its ground. Then, he blew his hora. Bad move! The cassowary objected by kicking the auto, pushing the radiator into the fan, which cut a hole in it.

(Anonymous; "Feedback," New Scientist, p. 104, June 13, 1998)

Comment. The flightless cassowaries are armed with sharp toenails, with which they disembowel New Guinea natives who displease them.

Eesides effectívely dísposing of obstre- perous automobiles, cassowaries are said to catch ftsh by wading into streams, spreading their wings, waiting, and then closing them to trap fish that have taken shelter there.

THE BIRDS

Remember the Hitchcock thriller with the above title? In it, a smaH seaside town was invaded by birds intent upon homicide. WeU, something a little bit like that really happened. The real-life event actuaUy helped Hitchcock plan his movie—of course, D. Du Maurier's short story with the same title helped even more! Here is what really happened on the California coast:

> In 1961, a small seaside town near Santa Cruz was bombarded by hordes of sooty shearwaters. The crazed birds pecked people, smashed into houses and cars, broke Windows and staggered around vomiting pieces oí anchovy over local lawns.

This attack was initiaUy blamed on foggy weather which might have dis- oriented the shearwaters, which normally stay far out at sea. The latest theory is based on the erratic behavior of the birds. They may have ingested fish that carried a marine neurotoxin caUed domoic acid. Domoic acid is produced by marine alga that bloom frequently along the California coast.

(Mestel, Rosie; "Hitch's Birds Deranged by Dodgy Anchovies," New Scientist, p. 6, July 22, 1995)

BIRDS ATTACK HDMAN TECHNOLOGICAL INFRASTRUCTURE

We are accustomed to termites feasting on our homes' timbers and mice gnawing in the walls, but in recent years many species have developed a taste for more sophisticated fare.

For example, the keas, which are aggressive mountain parrots of New Zealand, seem to have an innate urge to stripout the rubber gaskets around car Windows. Don't leave your car unat- tended for long in high eountry!

(Ager, Derek; "Unwary Animáis and Vicious Volts," New Scientist, p. 47, January 9, 1993)

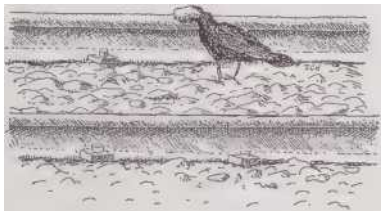
CROW WOES

> YOKOHAMA----Crows are being blamed for placing smaH stones on train tracks, which obstructed JR East train service on at least five occa- sions this month in Kanagawa Prefectura, prefectural pólice said.
>
> The evidence waB provided by an office worker who took a photograph of a crow placing smaH stones on a train track in Yokohama early Satur- day morning.
>
> When pólice learned about the stone-toting crow, they aimed a video camera at the tracks, Sunday and Monday, and discovered several crows carrying small stones between 3 to 10 centimeters in diameter in their beaks and laying them on the rails.
>
> On June 8 and 19, pólice found crow prints in the area.
>
> Kanagawa pólice said that recently there have been 21 incidents in which

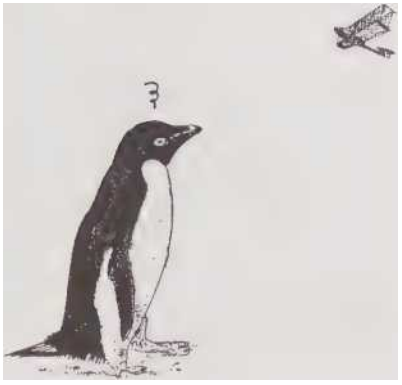
stones were found on train traeks.

These erows (aetually Jungle Crows) are known to drop stones on the roofs of houses, apparently because they like to hear the sounds of impact. Perhaps they also enjoy the erunching sounds as trains run over the stones they place on the rails!

(Anonymous; "Fun for Crows Equals Woe for Railroads," Mainichi Daily News (Tokyo), June 28, 1996. Cr. N. Masuya)



A Jungle Crow having fun (?) by put-tlng stones on Japanese railroad traeks.



A penguin wondering if that thing in the sky is a predator and whether toppling over is a good strategem.

(Tweedie, Neil; "Scientists to Check on Toppling Penguins," The Age, November 2, 2000. As downloaded from the web: www.theage.com.au/frontpage/20001102/A22021-2000Nov2.html. Cr. P. Huyghe)

But a missive from the British Antarctic Survey insists:

> ...there is no scientiflc evidence for penguins falling over backwards when helicopters overfly.

(Holden, Constanee, ed.; "Prostrate Penguins?" Science, 290:1495, 2000.)

Comment. Some birds are easily mes-merized. For example, one can hypno- tize a chicken simply by holding it down on a fíat surface for a minute or two. This will sometimes immobilize it for over an hour!

MISCELLANEOUS ODD BEHAVIOR

MAGPIES PAY FOR THEIR MEALS

One day last July, Gilí Waring noticed a magpie by the birdbath in her gar- den in Rosefield Avenue, Bebington, Wirral, Merseyside, after she had put some bread out for the birds. After that the magpie kept returning and she started finding coins around the birdbath. One day she saw it leaving money. After a month, the bird had left 1.70 pounds in denominations in- cluding 5p and 2p. Magpies, of course, are attracted to bright objeets and have a reputation as thieves.

(Anonymous; "Magpie Leaves Tip," Fortean Times, p. 23, no. 141, December 2000. bourel áted: Daily Mail, August 3, 2000)

Comment. The magpie's behavior was exactly opposite that of the pack rats or trade rats of the American Southwest. Paek rats are noted for stealing bright objeets from camps and leaving less attractive Ítems in trade.

TOPPLING-PENGUIN THEORY OVERTURNED

Above, we related how Antarctic penguins are reputed to become disoriented by watching overflying aircraft. These tales insist that the birds get so dizzy that they topple over backwards. This makes penguins appear rather stupid, when in truth they are being very smart.

Penguins, like most animáis, are counter-shaded, dark on the back, light below. When the penguins are swimming, avian predators have difficulty seeing them against the dark sea. Marine predators below tend to lose their white bellies when seen against the bright sky.

But when the penguins waddle across the white snow, the avian predators can spot them easily. Unless, of course, the penguins are clever enough to flop over on their backs exposing only their white tummies. Since they perceive aircraft as threats, they topple backwards intention-ally. Pretty smart of them!

(Browyer, Adrián; "White Out," New Scientist, p. 54, December 16, 2000)

Comment. More seríously, an outstanding exception to the countershading rule is Africa's ratel or honey-badger. It is white on top, dark on its belly. But like its cousin, North America's wolverine, the ratel is so strong and fierce that even lions avoid it. It doesn't need camouflage.

New Scientist cartoon accompanying the revelation about toppling penguins.

SUPERB FAIRY-WRENS FINALLY CATCH ON

A war is being waged between the brood parasites (cuckoos especially) and the host birds in whose nests the parasites lay their eggs. At the egg stage, the host birds can and often do recognize and eject the parasite's eggs, destroy them, or abandon their nests completely. The brood parasites responded to this countermeasure eons ago by somehow managing to lay eggs that mimic those of the host birds. The cuckoos are very good at this, although some host species have caught now on to this strategem.

Where the host birds really fail is in their almost universal inability to recognize and deal with parasite chicks, even when they are grossly different from their own chicks.

The only host species that is finally catching on at the chick stage of the battle is the superb fairy wren of Australia. Two species of cuckoos target this beautiful bird. But this fairy wren usually recognizes the parasite chicks for what they are and abandons the nest leaving the imposters to die. But it is the only exception we have found; ah other parasitized birds raise the alien birds as their own.

(Landmore, Naomi, E., et a;; "Escalation of a Coevolutionary Arms Race through ' Rejection of Brood Parasite Young," Nature, 422:157, 2003)

Comment. In North America the song birds are so naive that the brown- headed cowbird does not even try to mimic the eggs of its hosts. One often sees robins toiling to feed large cowbird chicks. Ornithologists theorize that this great gap in North American songbird defenses against the cowbird proves that cowbirds are recent brood parasites. Either defenses will soon evolve or there will be some songbijrd exterminations.

TALES OF TOPPLING PENGDINS.

British scientists are heading for the South Atlantic in an attempt to dis- prove claims that penguins fall over backwards when aircraft fly overhead.

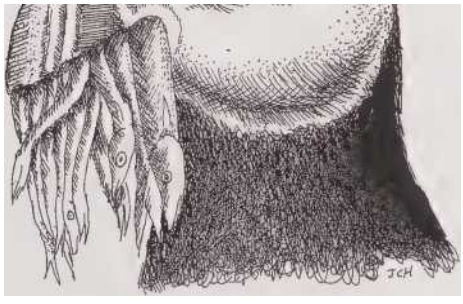
Roy al Navy and RAF pilots have been bringing back reports of top- pling penguins since the Falklands War in 1982. The flightless birds are said to be so mesmerized by helicop- ters and jets that they lose their balance as they attempt to keep track of them.

TALENTS AND FACULTIES

PUFFIN TONGDE TRICK?

Puffins are frequently seen returning to their chicks with beakfuls of several slippery flsh. The age-old question has been: How can these birds catch and retaln additional físh after they have captured the first one or two? Sometimes nearly a dozen wiggly prey fiH the puf- fin bilis right to their tips. The answer is and has been for centuries that they hold the fish in place with their spiny tongues. But don't some fish escape or, if dead, fall out when the tongue is moved to lock in each new slippery catch? Obviously, the tongue has to be the answer. It just seems so unlikely.

(Greenwood, J.J.D.; "Cutting Bills," New Scientist, p. 57, September 6, 2003.)



DO WOODCOCKS "GRÜNT" FOR WORMS?

Earthworms have a potentially fatal habit: When they detect vibrations propagating through the ground, they quickly squirm their way to the surface. Perhaps they think a mole is tunneling after them, or maybe rain is beating down above. What- ever goes through their "minds," they emerge on the surface in response to vibrations and may be snapped up by several species that know their weak- ness.

Human fishermen know the worms' weakness and "grunt" for them in several ways; say, by drawing a notched stick across the trunk of a small tree to generate vibrations. Wood turtles are said to "stomp" for worms. (vol. 1, p. 148) Kiwis and Kagus also stomp for their dinner. (Kagus are rather strange birds found in New Caledonia. See below.) We understand that Woodcocks will beat their wings against the ground to produce the vibrations that coax earthworms within range.

(Hennigan, Tom; "A Wonderfully Bizarre Bird," Creation/Ex Nihilo, 19:54, Sep- tember-November 1997)

Comment. Woodcocks seem to lure worms to the surface in still another way: They "bob" or "rock" their body in a most peculiar manner. It is thought that the resulting pressure waves are transmitted to the ground through their feet and that these bring their favorite prey to where they can be grasped.

(Marshall, William H.; "Does the Wood-cock Bob or Rock------and Why?" The Auk, 99:791, 1982)

GRÜNTING TRANSCENDS BIOLOGICAL AND GEOGRAPHICAL BOUNDARIES

"Grunting for worms," that is. Birds are the most frequent worm-grunters; but reptiles do it (turtles; vol. 1. p. 148; and so do mammals (humans, p. 103. Grunting is an amusing and effective technique for luring earthworms to the surface where they can be consumed or used for fish bait.

Animáis usually grunt for worms by stomping on the ground after a rain. Just why the worms below rush to expose themselves upon detecting these seismic signáis is known only to them. Perhaps they think more rain is falling or that a mole is burrowing toward them. All we know is that grunting Works.

In the article under review, English seagulls are reported doing a flat-footed versión of an Irish jig to entice their dinner to the surface. Oystercátchers, on the other hand, prefer a reel-like dance in which they cavort in circles and straight lines. Somehow, the grunting technique has been communicated to birds everywhe're. Red-biUed guUs in New Zealand grunt for worms, so do the olive thrushes of South Africa.

(Smith, Richard Hoseason, et al; "Rain Dance," New Scientist, p. 102, May 12, 2001.)

Comment. It is mildly anomalous that this unlikely hunting technique is found in so many places and employed by so many species.

Our own research adds that strange New Caledonian bird, the kagu, to the list of worm-grunters. How did the kagu on an isolated Pacific island learn the technique? And in the States, another very strange bird, the woodcock, can sometimes be seen engaged in a weird rocking motion that is believed to set up pressure waves in the soil that lures earthworms to within reach of its long, forceps-like bül. (See our catalog Biological Anomalies: Birds)

BIOLOGICA!* PRECURSORS OF THE 1995 ROBE EARTHQOAKE

The Japanese are meticulous observers of animáis. Many keep birds, insects, fish, etc. as pets. When scientists at the Osaka City University asked for reporte of unusual animal behavior around the time of the great January 17 quake, over 1,200 people in the Kobe-Osaka area carne forth with anecdotes. Typical pre-quake observations involving birds were:

- Doves flying into walls.
- Caged birds (Chínese hawk-cuckoos) flying against the sides of their cages.

(Minami, Shigehiko; "Creatures Went a Bit Batty, Maybe Knew Quake Was Corning," Asahi Evening News, February 25, 1995. Cr. N. Masuya)

Comment. Birds, fish, snakes, and many other animáis seem to be able to sense earthquake precursors. Even humans are somethimes prescient when they com- plain about oppressive,]itter-inducing "earthquake weather." See our catalog Biological Anomalies: Humans I.

New Caledonian kagus will spontaneously explode in strange, wild dances. In addition, they also grunt for worms.

FLIES FLY INTO FROGMOÜTH'S MOUTH

Behind this deliberately cryptic title lurks a curiosity that verges on the anomalous; namely, a bird (the Papuan frogmouth) that apparently secretes a substance in its cavernous mouth that attracts files. This bird, according to several observers, does not have to fly with its mouth agape to catch insects like its relatives (whippoorwills, etc.). It often simply sits on a branch with its huge mouth open, and flies enter of their own accord to investígate the source of a promising odor.

J. Diamond, who wrote about this "living flytrap" in the February issue of Natural History, wondered about the evolutionary rationale here:

> My first thought was, nonsense! If so, frogmouths would have achieved every species' evolutionary dream— getting food without Work or cost. Then I reflected that there was in- deed a cost, that of synthesizing the sticky Chemical bait. On the other hand, a raven-sized bird would have to attract a lot of flying insects be- fore its strategy of setting itself up as a living flytrap could rate as suc- cessful.

In the same article, Diamond intro- duced the reader to two other remarcable birds also found in Papua New Guinea. Both of these birds are meaty, lumbering, and easy to kill. Ideal prey, one would suppose. However, almost as they gasp their last breath, they begin to stink. Predators learn to avoid them. Natives who sometimes hunt them joke that one has to have a pot of boiling water under the tree where the bird sits so that it can fall in and begin cooking immediately!

(Diamond, Jared; "Stinking Birds and Burning Books," Natural History, 103:4, February 1994)

BODILY FUNCTIONS

OCTOBER 5, 1998: DARE DAY FOR HOMING PIGEONS

Just what happened on October 5 may never be known. On that day thousands of homing pigeons were -released by their proud owners in widely separated loca- tions expecting they would quickly race home to their lofts. Few made it.

•In three sepárate races in New York and Pennsylvania, a total of 4,000 birds were released on October 5. Only 400 returned home.

•3,000 pigeons released in California on the same day are still missing.

All over the planet, homing pigeons are not homing as well as they used to. Performance has been falling steadily over the past two decades. The favorite theory blames geomagnetic storms, but no such correlation has been shown. Microwaves are fingered next. Cell phones and satellite Communications fill the atmosphere ever more densely with rucrowaves that may throw off the naviga- tion equipment of homing pigeons, but this hasn't been demonstrated yet either.

(Ensley, Gerald; "Case of the 3,600 Dis- appearing Homing Pigeons Has Experts Baffled," Chicago Tribune, October 18, 1998. Cr. J. Cieciel. Also: Schoettler, Cari; "Pondering the Great Homing Pi- geon Panic," Baltimore Sun, October 18, 1998)

STARLINGS FALL OÜT OF THE SKY

Late October, 1998. Tacoma, Washington.

About 300 starlings dropped out of the sky on this date. Neither poison ñor disease was the cause. The birds all suffered crunched chests and blood clots in hearts and lungs. Since starlings fly in tight formations, some speculated they had smashed into the side of a large truck (?), or perhaps a wind gust had thrown them to earth violently.

(Anonymous; "Bird Deaths Still Mystery," Houston Chronicle, October 31, 1998. Cr. D. Phelps. Also: Anonymous; "300 Starlings Drop out of Sky Dead," Scran- ton Times, October 31, 1998. Cr. M. Piechota)

Comment. A much greater avian catas- trophe took place near Worthington, Minnesota, March 13-14, 1904. After a storm, dead and dying Lapland Long- spurs were strewn over a wide area. A scientist from the Minnesota Natural History Survey marked off Bquares in the snow covering two frozen lakes and began counting and counting and coun- ting. On the lakes alone, 750,000 Lap- land Longspurs lay dead. It was esti- mated that 1,500,000 died just in the area around Worthington. The injuries of the longspurs were much like those suffered by the starlings. (Details in our catalog: Biológica! Anomalies: Birds)

FEMAI.E FERAL FOWL FOIL RAPISTS

Male animáis possess an inspired arsenal of devices to ensure that their sperm are the ones that fertilize chosen females. Their mechanical devices range from scrapers that physically remove sperm deposited by competing males to plugs that block sperm access in subsequent matings. It is claimed that some male ejaculates introduce not only fertilizing sperm but also "kamikaze" sperm special- ly designed to hunt down and destroy competing sperm.

Well, both sexes can play these games. Some females have ways to eject sperm from undesired males. For ex- ¿mple, female feral fowl (hens gone wild!) prefer to mate with dominant males. Often, however, subdominant males forcé themselves on the females despite resistance and stress calis. The female response to such rapes is diffe- rential sperm ejection; that is, they immediately expel the unwanted ejaculate —at least most of it—raising the probability that they will be fertilized by the preferred dominant males.

(Pizzari, T., and Birkhead, T.R.; . "Female Feral Fowl Eject Sperm of Sub- dorainant Males," Nature, 405:787, 2000)

Comment. An interesting sort of sperm ejection occurs among Dunnocks, small brown birds common in English gardens. Alpha males try to prevent matings by lower-ranking males but are rarely sue- cessful. Most Dunnock matings are pre- ceded by a ritual-like phenomenon called "cloaca-pecking." The female raises her tail exposing the cloaca. Instead of mating, the antidpating male pecks at the cloaca, an action that stimulates a pumping action and ejection of a droplet of sperm from previous matings. After the male inspects the droplet, normal mating follows.

This bizarre scenario required the coordinated evolution of two different kinds of behavior (male and female) as well as the development of the female's sperm- ejection mechanism.

The male Dunnock's "cloaca-pecking" strategy supposedly causes the female to eject a rival male's sperm, But the female may deliberately retain some!

A REALtY ERRANT PIGEON

Two years ago, a racing pigeon, owned by Londoner W. Pope, disappeared during a 556-mile race from Southern Franee to Western England. Just re- cently, this bird fluttered into a pigeon loft in Beijing!

(Anonymous; "British Pigeon, Missing 2 Years, Lands in Beijing," Baltimore Sun, March 25, 1994)

THE FOOD-STORAGE LOCKER OF THE MALE RING PENGUIN

The stomachs of these Antarctic birds can store fresh, still-undigested fish for up to three weeks—a unique talent among the higher vertebrates. This talent is useful for feeding the chicks while the females are at sea hunting. Ordinarily, such food is digested rapidly.

(Young, Emma; "Penguin Dads Keep Their Fish Fresh," New Scientist, p. 21, . February 22, 2003)

ORGANS

WHEN SCENTS MAKE NO SENSE

The universe of voles-----small, mouse-like rodents—is one of odor. They eomraunicate with one another and navi-gate through their World of grasa and vegetation by laying down trails of scent-laden uriñe.

The world of kestrels—eaters of voles—is one of sight. Now, voles are hard to see in the grass far below a hunting kestrel, but evolution has come to the aid of the kestrels by giving them the capability to see in the ultra- violet portion of the spectrum. Can it be only coincidence that the uriñe trails of the voles happen to absorb ultra- violet light strongly? Kestrels can see these trails as dark streaks in the grass below and zero in on their prey.

Finnish scientists, led by E. Korpi- naki at the üniversity of Turku, have demonstrated the above ultraviolet con-nection by somehow acquiring enough _ volé uriñe to lay out artificial trails in voleless areas. Sure enough, hunting kestrels were attracted to the experi-mental site and searched and searched the artificial volé highways-----volelessly.

(Aldous, Peter; "Vole's Orine Is Their Downfall," New Scientist, p. 15, Febru- ary 4, 1995. Gee, Henry; "In the Eye of the Kestrel," Nature, 373:387, 1995)

Comment. Even as you read this, evolution is surely helping the voles by alter- ing the ultraviolet signature of their uriñe! Sure, this is a bit facetious, but predator-prey relationships are always seesawing. We see this vividly in organ- isms with very short generation times, such as in antibiotic-resistant malaria.

A Kestrel (sparrow hawk) with its ultraviolet-sensitive eyes can spot the traces of uriñe left on volé trails below.

MÜLTITASKED AVIAN EYES?

Biologists have long searched the animal world for magnetoreceptors that could explain how migratory animáis sense the geomagnetic field and thus gather navi-gational information. Bits of synthesized magnetite have been discovered in spe- cies from bacteria to humans. These seem to be useful in the narrow confines of a bacterium's world, but in higher animáis the required neuronic connections to the brain seem to be absent. These bits of magnetite are suggestive but seem non- functional in most animáis.

Surprisingly, the operational magneto-receptors in vertebrates are now thought to be present in an unexpected place: the retinal pigments of the eyes. That these eye-dwelling detectors of the geomagnetic field are complex and highly innovative can be appreciated in this quotation from W. Wiltschko et al:

> In birds, magnetic compass orienta- tion is based on light-dependent pro- cesses asssumed to take place in the eyes. Certain macromolecules are raised by photo-absorption to singlet- excited States, forming radical pairs. By hyperfine coupling, singlet pairs are interconverted into triplet pairs. The triplet yield depende on the alignment of the molecules in the ambient magnetic field and could thus be used to detect directions.

Wiltschko et al have tested migratory birds with right or left eyes covered. They found that the magnetic sense is, like many human mental faculties, highly lateralized. In the tests, the magnetic sense seems confined mostly to the right eye, which is linked to the left hemi- sphere of the avian brain.

(Wiltschko, Wolfgang, et al; "Lateraliza- tion of Magnetic Compass Orientation in a Migratory Bird," Nature, 419:467, 2002) ■

PARBOTS' SYRINXES SHRANK

Parrots are good talkers but lousy sin-gers. In fact, they don't sing at all.
One reason for their lack of musical talent is that their syrinx, the avian sound-producing organ, turns out to be unilateral in parrots but bilateral is the rest of birddom. However, the human larynx is also unilateral, and both parrots and humans have long, muscular tongues. Parrots are physio- logically adapted to their destiny of entertaining humans. But this outcome was probably not in evolution's scenario.

(Jarvis, Erich D.; "Who's a Clever Boy?" New Scientist, p. 65, March 1, 2003)

Comments. Why parrots' syrinxeB degen-erated is unknown. Even curiouser, though, is the observation that parrots in the wild never imitate anything. It takes human contact to make them talk.

Also interesting is the ability of those thousands of other birds with bilateral syrinxes to sing two harmonically unre- lated tones at the same time. This is the so-called "two-voice" phenomenon. (See our catalog Anomalies on Biology: Birds.) In the eastern U. S., the common wood thrush is often heard singing two notes simult aneously.

BARN-OWL AÜDITORY NEURONS MULTIPLY SIGNAIS

Barn Owls can lócate rustling mice in the dark with high precisión. They discern their prey by sound rather than light. To achieve the high accuracy needed to home in on small rodents in the black of night, their ears are slight- ly offset so that they can draw a bead by using microsecond time-of-arrival dif- ferences in the sounds coming from the target. To increase the owl's passive sonar, their auditory neurons multiply the signáis instead of adding them as do other neurons. In effect, they create an "auditory map" of their surroundings.
On their high-precision auditory maps, a rustling mouse would be highlighted.

So far, though, biologists have not learned how neurons can múltiple signáis.

(Helmuth, Laura; "Location Neurons Do Advanced Math," Science, 292:185, 2001)

The asymmetrical design of the Barn Owl's ears is essentiál for pinpointing the location of its prey in the dark.

AVIAN PALEONTOLOGY

FOSSIL FEATHERS FLY

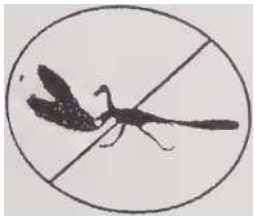
Our alliterative title is apt on two counts: (1) Recent research on the famous Archaeopteryx fossils suggest that this animal could indeed fly and was arboreal rather than terrestrial; and (2) The paleontologists and orni-thologists are still fighting (sometimes emotionally) over how Archaeopteryx fossils should be interpreted.

The scientific acrimony centers on whether this ancient bird really evolved from small theropod dinosaurs. Prevailing theory has it that these dinosaurs first evolved feathers to keep warm and then used their . feathered "arms" to help capture insects, and so on, with some aimless flapping, to the attainment of true flight. A rival, officially frowned- upon theory has it that birds evolved from tree-dwelling reptiles that evolved feathers to break their falls while jumping from branch to branch! [Somehow, neither theory strikes a realistic chord. Why couldn't feathers have evolved solely for the purpose of flight? Answer: because evolutionists cannot countenance purpose in nature.

Anyway, the latest fusillade in the Archaeopteryx wars was fired by A. Feduccia in Science. Feduccia demon-

strated tliat the elaws of Archaeopteryx are sharp and curved like those of modern arboreal birds and quite unlike either terrestrial birds or theropod dino- saurs. In eoncluding his long, detailed paper, Feduccia highlights nine addition- al features of Archaeopteryx that make it look like a modern arboreal bird; i.e., barbed feathers, asymmetrical flight feathers, etc. V. Morell quotes Feducci as saying:

> Paleontologists have tried to turn Archaeopteryx into an earthbound feathered dinosaur. But it's not. It is a bird, a perching bird. And no amount of 'paleobabble' is going to change that.



A. Feduccia's cartoon of the bug- catching phase of bird evolution.

(Feduccia, Alan; "Evidence from Claw Geometry Indicating Arboreal Habits of Archaeopteryx," Science, 259:790, 1993. Morell, Virginia; "Archaeopteryx: Early Bird Catches a Can of Worms," Science, 259:764, 1993. Monastersky, R.; "Flight: A Bird Hand Is Worthy in the Bush," Science News, 143:87, 1993)

Comment. Unremarked in the three arti- cles referenced above is a more serious anomaly that is highlighted by the many modern features of Archaeopteryx; for example, the lack of any transitional fossils between Archaeopteryx and its ancestors. Where are reptiles with erudely feathered, but somehow useful tails?

One reconstruction of Archaeopteryx. There is a remarkable superficial resem- blance here to the living South American Hoatzin. Young Hoatzins also sport elaws on their wings.

ARCHAEOPTERYX REVISITED

Do you recall the furor raised by F. Hoyle and others in the 1980s when they claimed that one of the famous fossils of Archaeopteryx, the primordial bird, had been faked? After ah, the Archaeopteryx fossils showed conclusively that birds evolved from reptiles, and that fact could not be challenged without retribution. Well, that storm blew over, at least as far as the paleontolgists are coneerned. (See story in BBE7 in Biologi- cal Anomalies: Birds)

But in 1999, a fossil just as important as Archaeopteryx turned up in China. It was clearly a "feathered dinosaur." Pale- ontologists knew there had to be one around somewhere. Named Archaeoraptor liaoningensis, the fossil had the long bony tail of a dromaeosaurid dinosaur and the specialized chest and shoulders of a bird capable of flight. It was a welcome addition to the avian family tree.

"Hold everything," said Xu Xing, an eminent Beijing paleontologist, this fossil displays "anomalies." That vías an under- statement, the fossil has turned out to be a "chimera"; that is, two species fused ("glued," in this case) together.

Nevertheless, seientists insist that other faets prove that birds evolved from dinosaurs.

(Monastersky, R.; "All Mixed up over Birds and Dinosaurs," Science News, 157:38, 2000. Kurtenbach, Elaine; "Sei- entist Disputes Fossil Theory," Houston Chronicle, January 22, 2000. Cr. D. Phelps)

Comment. Piltdown Man was also an arti- ficial chimera. In truth, there are honest natural chimeras, like the strange human mother-son chimeras. (p. 102)

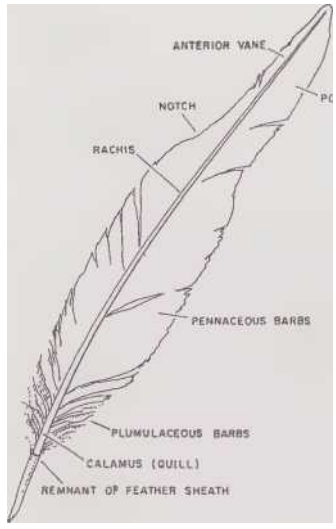
'MODERN' FEATHERS ON A NON- AVIAN DINOSAUR

So reads the title of a one-page article in the March 7, 2002, issue of Nature. Feather-like structures have recently turned up on several species of fossil, non-avian dinosaurs; that is, dinosaurs obviously unable to fly despite a coat of skin structures looking suspiciously like proto- feathers. The latest fossil, dubbed BPM 1 3- 13, and like the others found in China, leaves no doubt about the presence of feathers. A sentence in the Nature article states:

> The feathers of BPM 1 3-13 are structurally identical to those of modern birds, indicating not only that modern feathers must have evolved in dinosaurs before the emer- gence of birds and flight, but also that the feather-like structures pre- sent in many other non- avian thero- pods are homologous with feathers.

(Norell, Mark, et al; "'Modern' Feathers on a Non-Avian Dinosaur," Nature, 416: 36, 2002. Hecht, Jeff; "Dinos of a Fea- ther," New Scientist, p. 11, March 9, 2002)

Comments. The above statement is not quite right because the fossil's feathers are symmetrical, while most feathers on most modern birds are asymmetrical, as required for good aerodynamic proper- ties. (The feathers on the fossil Archaeopteryx are asymmetrical!) Modern birds that are dressed completely in symmetri-



The flight feathers of modern birds are here seen to be surprisingly complex even though the hooklets are omitted. Obviously, this feather is asymmetrical.

cal feathers are all flightless—like the non- avian dinosaurs were. The ratites, such as the ostrich, typify modern flightless birds with symmetrical feathers.

Some questions arising from the dis- covery of a truly feathered dinosaur fossil now follow.

(1) Were the fossil's feathers evolved actually for thermal insulation or some other non-avian application?

(2) Were they the unavoidable secon- dary consequence of a mutation producing a different characteristic of very high survival valué; i.e., were the feathers an evolutionary accident?

. (3) Are the fossil's feathers an example of what evolutionists cali "pre- adaptation"; that is, a step along an already planned path of development ("teleology")? In other words, were some dinosaurs were meant to fly? Obviously, "preadaptation" is a word to be avoided, although it does show up in mainstream books.

(4) Half-seriously, could the fossil BPM l 3-13 actually be an early ratite rather than a proto-flightéd bird?

(5) Finally, might BPM 1 3-13 really be the degenerate descendent of fully flighted animáis (not necessarily birds) bearing asymmetrical feathers, just as today's ostriches are thought to be. We have only to find the transitional fossils to be sure.

COLD-BLOODED BIRDS?

Zoologists have been taking it for gran- ted that birds evolved from warm- blooded, active dinosaurs. They may now have to redraw that part of the avian family tree, because the microscopio structure of the leg bones of two species of long-extinct birds suggest otherwise.

> Cross sections of the bones of these birds, which lived during the time of the dinosaurs, reveal growth rings — concentric rings where normal bone growth was interrupted, possi- bly because of seasonal temperature changes. No such rings are found in the bones of modern birds, which maintain their body temperatures metabolically even in coid weather.
> But growth rings are found in such reptiles as crocodiles, which eannot maintain their temperatures meta- bolically, and in some fossil dinosaurs .

(Browne, Malcolm W.; "Study May Shake Birds Down from the Dinosaur Tree," New York Times, March 17, 1994. Cr. J. Covey)

INTERSPECIES PHENOMENA

FACING ÜP TO DIVEBOMBERS

When spring arrives Down ünder, the black-backed magpies divebomb every- thing that moves in the vicinity of their nests. No one is spared: kids, cats, politicians, and even ornithologists are fair targets. But the solution is simple:

> The National Parks and Wildlife Service reminds blitzkrieged Aussies that the birds are less likely to attack if they believe they are being watched. So the chic and the sensible don hats with sunglasses propped on top —facing backwards, of course.

(Anonymous; New Scientist, p. 84, Feb- ruary 24, 1996)

Comment. The same solution has been adopted by Indians who work in tiger country. They wear human face masks on the backs of their heads. Tigers don't like to be watched either.

DNEXPECTED BIRD REPELLANT

In the big cities, statues and public buildings are too often disgustingly draped in bird droppings. A remarkable exception to this worldwide phenomenon is a 120-year-old bronze statue standing in a park in Kanazawa, Japan. Birds of all species avoid this statue like the plague. But why do they spare it? It is just as likely a perching spot as thou- sands of other park statues around the world.

Y. Hirose, at Kanazawa University, after experimenting with the various materials employed in making the statue, concluded that the birds were repelled by the presence of a small quantity of gallium entrained in the bronze. Why birds should have an aversión to gallium
-----a metal that sometimes replaces mer- cury in high-temperature thermometers —is unknown.

Hirose is now developing a gallium- rich spray for application to some perching spots favored by birds.

(Anonymous; "We Hear That...," New Scientist, p. 17, July 26, 2003)

Comment. In early October 2003, Hirose received an Ignoble Prize for his dis- covery.

OÜR GENES AREN'T US!

This title was applied to many animáis in the referenced article, including birds, as we now see:

> Wings have been invented at least four times by divergent classes (ptero- saurs, insects, birds, bats); and it is very unlikely that there is a common DNA sequence that specifies how to manufacture a wing.

(Cohén, Jack, and Stewart, Ian; "Our Genes Aren't Us," Discover, 15:78, April 1994)

Comment. Since the above article was written (1994), it has been discovered that genomes contain much information that may not be expressed all species. In short, "wing" information may be suppressed in many genomes and re- leaed when needed!

REPTILES

SNAKES ALOFT

Fish, frogs, squirrels, and other animáis have developed extended body surfaces that permit them to launch themselves from trees and ride the air for long dis- tances. If they can travel four horizontal feet for every foot they drop, they are classified as "gliders." Those animáis with . less aerodynamic surface are merely "para- chutists."

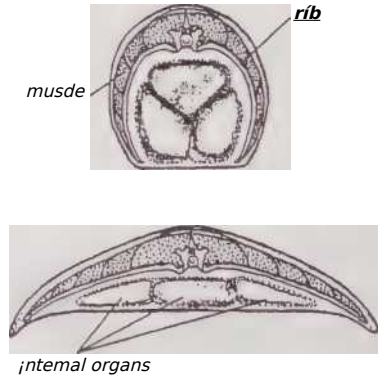
When one looks at a snake's long tubular physique, one is inclined to deny them entrance to both the glider and the para- chutist clubs. Snakes should fall from trees like rocks. Most do just that, but a few are. excelleát gliders.

The paradise tree snake of Southeast Asia is one of the best reptilian gliders.
It can flatten its body to resemble an airfoil, actually doubling its horizontal surface. Its ribs fiare out almost like a bird extending its wings. Even its inner organs pancake themselves.

Besides shapó-shifting, this tree snake "swims" through the air, writhing in S- shaped bends. Its entire body thus acts aerodynamically like the slotted wings one sees on high-lift (STOL) aircraft.

From a 100-foot tree, the paradise tree snake can glide the length of a football field. That's pretty good for a legless, armless creature.

(Summers, Adam; "Serpents in the Air," Natural History, 112:38, May 2003)



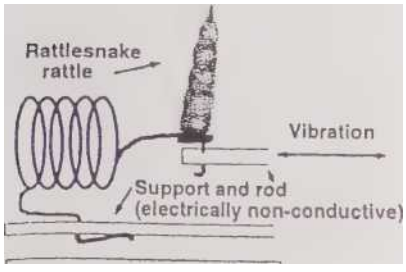
Cross sections of the paradise tree snake. (Top) Normal configuración. (Bottom) Flattened-out for gliding.

Comment. The evolutionary innovations are several and rather profound: the flaring ribs, squashing of the internal organs, and the proper "swimming" be- havior providing the slotted-wing effect. The payoff in being able to glide must be worth a lot of mutations!

ELECTRIC SNAKES

We have already written about electric fish and how they employ electrical fíelds to create an "image" of their en- vironment. (p. 140) Snakes, too, it seems, possess an electrostatic sense.

Snakes were not blessed with the voltage-generating organs of electric fish, but the simple act of slithering along the ground can generate potentials of 100-1,000 volts. In fact, their dry skin seems adapted to generating and retaining electrical charge. Even more curious, laboratory experiments with snake rattles demónstrate that they can generate 75-100 volts when shaken!



Voltmeter

The experimental s'etup faz demonstra- ting how rattlesnake ráttles generate piezoelectricity.

What is the electrostatic payoff for snakes in their search for prey? It is hard to say. Who has followed hungry snakes around checking on their electric fíelds? A clue may lie in the ways snakes use their forked tongues in hunting. When following a Chemical trail, snakes usually touch surfaces with their flicking tongues. In general exploration, when Chemical trails are absent, snakes seem to wave their tongues up and down in a distinctive manner, avoiding surfaces. Herpetologists usually ascribe this action to Chemical "sniffing." However, W.T. Vonstille and W.T. Stille, III, venture a different explanation:

> The fact that moist air is conductive for the electric charges that exist on the Earth's surface could be very important to a snake's survival. The airborne plumes of moisture exhaled by animáis and flowing out from un- der cover are invaded by static charges from the Earth and could be detected by snakes.

(Vonstille, W.T., and Stille, W.T., III; "Electrostatic Sense in Rattlesnakes," Nature, 370:184, 1994)

WHY SNAKES HAVE FORKED TONGUES

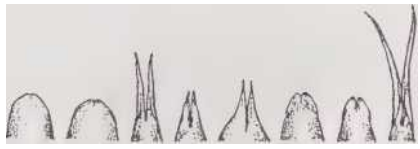
Laymen and scientists alike have won- dered for millennia why some reptiles possess forked tongues. It seems that we may now have an answer:

> Theory, anatomy, neural circuitry, function, and behavior now support a hypothesis of the forked tongue as a chemosensory edge-detector used to follow pheromone trails of prey and conspecifics [especially the opposite sex]. The ability to sample simultane- ously two points along a Chemical gradient provides the basis for the instantaneous assessment of trail location.

The framer of this hypothesis, K. Schwenk, adds that the forked tongue and, obviously, the muscles and neural circuitry to use it properly, have evolved independently at least twice, possibly four times.

(Schwenk, Kurt; "Why Snakes Have Forked Tongues," Science, 263:1573, 1994)

Comments. One can compare the forked tongue to binocular visión. Both re- quire the parallel evolution of impres- sive infrastructures of data Processing "equipment."



Some variations of the forked-tongue theme among lizards and snakes.

PYTHON TRIES TO SWALLOW CALF ELEPHANT ----------BAD IDEA!

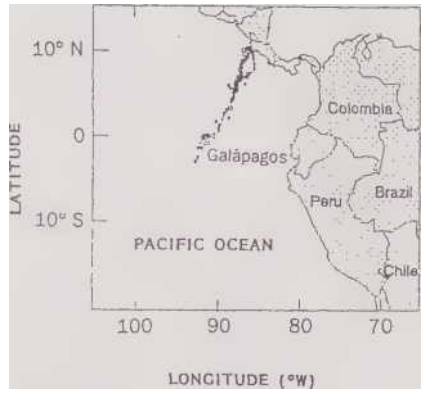
> The python had seized the elephant by a hind leg and, mooring itself to a tree, started a fight to the death.
> The fight see-sawed crazily around the clearing for hours, smashing the under- growth fíat as the elephant tried in vain to free its leg.
> Eventually the python "swallowed" the elephant's leg. Then carne a dead- lock. The elephant could not move and the reptile could not swallow any more.
> Villagers stepped in, hacked the python to pieces with their razor- sharp swords and freed the elephant.

(Anonymous; "Python Tries to Swallow a Calí Elephant in India," New York Times, October 28, 1952. Cr. M. Piechota)

SEA TURTLES: FROM ONE END TO THE OTHER

Leatherback turtles are mysterious in several ways: flexible shell, warm- bloodedness, etc. (See vol. 1, p. 147.) Now, we add two more remarkable capa- bilities to their dossier.

Precisión navigation. The oily, flexible shells of leatherbacks have made it diffi- eult for researehers to attach radio transmitiera to the animáis. Their very deep dives (over 1,000 meters) are also inimical to human instrumentation. But S.J. Morreale's group at Cornell have succeeded in attaching pressure-resistant' transmitiera to the shells on short tethers. This team was able to track female leatherbacks as they left their nesting beach in Costa Rica and headed southward, past the Galápagos, out into the open South Pacific. Surprisingly, all the leatherbacks plied a very narrow corridor each year of the experiment (1992-1995). In fact, the paths were almost identical for at least 2,700 kilo- meters Southwest of the Galápagos. High- precision navigation equipment is re- quired here. Among the leatherbacks' "instruments" are probably sensors that detect the angle of the geomagnetic field, the length of daylight, and the identities of the oceanic currents en- countered. There are probably other sensors and, of course, a brain to procese all the signáis; but virtually no- thing is known about them.



Route taken by leatherback turtles breeding on Costa Rican beaches.

(Morreale, Stephen J., et al; "Migration Corridor for Sea Turtles," Nature, 384: 320, 1996. Also: Monastersky, R.; "Do Sea Turtles Stop and Ask for Directions?" Science News, 150:342, 1996)

Rectal gills. Sea turtles are airbreathers that make long, deep dives. To descend deep for long periods, they have evolved a diving adaptation radically different from that employed by the dolphins, whales, and seáis; namely, rectal gills. They breathe air at the front end and water at the rear. Water is pulled in through the rectum and directed to sacs lined with blood vessels. These function like fish gills by extracting oxygen from the seawater. The oxygen-depleted water is them expelled and another "breath" is taken.

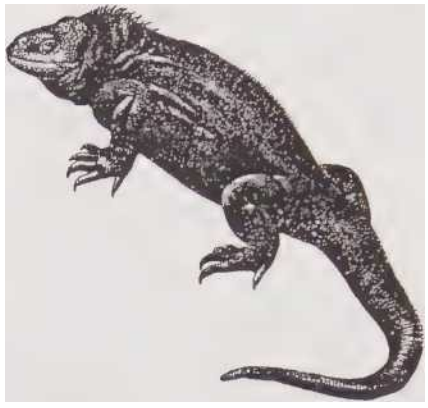
(Green, John; ISC Newsletter, 11:10, no. 3, 1991. Actual publication date: 1997. ISC = International Society of Cryptozoology.)

HEART-STOPPERS

The marine iguanas of the Galápagos are remarkable in their unlizard-like ability to forage for vegetation and other tidbits underwater. These iguanas make good eating, and they are at risk along the rocky shores of the Galápagos. But the marine iguanas have special card to play when approached by sharks armed with their supersensitive hearing. The iguanas voluntarily stop their hearts from beating. Otherwise, sharks as far away as 3-4 meters can home in on their heartbeats. Amazingly, marine iguanas can survive up to 45 minutes without functioning hearts. This represents a remarkable evolutionary adaptation in the perpetual warfare between prey and predators.

But, to the west across the Pacific, in Indonesia, another reptile, the fear- some Komodo dragón, can also voluntarily stop its heart. Komodo dragons have no sharks to fear. In fact, they are the top predators on the islands they inhabit, dining on deer and, rarely, a human or two. Was this a purposeful adaptation? If so, to what threat?

(Knight, Jonathan; "King of Hearts," " ' New Scientist, p. 51, November 20, 1999)



A Galápagos marine iguana.

THE HUNT FOR THE MAGNETORECEPTOR

When magnetite partióles were found in organisms from bacteria to bats, it was assumed that here was the long-sought magnetoreceptor which animáis used for magnetic navigation. But so far, biolo- gists do not have the slightest notion how such magnetite partióles can be turned into a "magnetic sense," which sends the brain information on the direc- tion of the geomagnetic field or, perhaps, draws a magnetic map of sorts.

A completely different sort of magne- toreceptor is now under investigation, one that humans may unknowingly possess It eschews magnetite and instead utilizes special photoreceptors in the eye. These employ an electron-spin resonance procesa that is modulated by the geomagnetic field. Some of our very sensitive scientific magnetometers use similar phe- nomena. The biological versión of such a receptor would be connected to the brain, as the eye is, and send signáis registering the direction of the earth's magnetic field.

Sounds interesting, but is there any basis for thinking that such a technically sophisticated mechanism exists in any known terrestrial creatures?

It seems that some experiments with newts by J.R. Phillips and S.C. Borland support the idea that eyes are involved in magnetoreception. The newts were first trained to orient themselves in a certain direction with respect to the geomegnetic field.

> When tested under one of four artificial field alignments (magnetic north at geographical north, east, south, or west), the newts kept their training directions constant relative to the • magnetic rather than the geographic system of reference, but they selected difference angles with respect to the magnetic field when they were ülumi- nated by either short (<^450 nm) or long-wavelength light (^500 nm). When tested under 475-nm light, or in the dark, they were completely disoriented.

The experiments demonstrated that light was crucial to the newt's magnetic sense, and that photoreceptors were somehow involved. The most likely loca- tion of the magneto-sensitive 'photoreceptors would be the newt's eyes.

(Wehner, Reudiger; "Hunt for the Magne- toreceptor," Nature, 359:105, 1002)

Comment. Can such a technologically sophisticated mechanism be achieved by small random mutations and natural selection?

AMPHIBIANS

PROG POISON FACTORY

Several species frogs in the New World tropics somehow segregate toxins from the prey they catch and convey them internally to their skins. These frogs are then not only unpalatable but can even be deadly to predators higher up on the food chain.

This sort of frog chemistry is all amazing enough, but at least three species of Dendrobates frogs go even fur- ther and modify their ingested toxins to make them even more dangerous to their enemies.

Specifically, they convert pumiliotoxin 251D to allopumilotoxin 267A by adding an extra hydroxyl group. Apparently, these species have evolved (by chance, of course) an enzyme that possesses the specific capability of attaching these hydroxyl group s taken from hydroxyl reservoirs these amphibian chemists happen to carry around with themI

(Milius, S.¡ "Skin Chemistry," Science News, 164:148, 2003.)

FROG VIBRATIONS

Zoologists already knew that the Puerto Rican white-lipped frogs frequently used vibrations to communicate amongst them- selves. The Malaysian tree frog can now be added to the list of substrate vibra- tors. The female tree frog will sit upon a reed or small sapüng and tap out a "come-hither" message with her toes.
The message goes forth in a train of minute seismic waves. The males detect these vibrations and proceed, sometimes in great numbers, to the source of the vibrations, and the species is thereby perpetuated.

(Mestel, Rosie; "Courting Tree Frogs Make the Earth Move," New Scientist, p. 8, December 10, 1994)

FROG VIRTUOSOS

Among the birds, ravens croak coarsely while wood thrushes fill the woods with melody. It is the same with frogs. Most croak but a few trill and warble. A Chinese frog, Amolops tormotus, is capable of "countless vocalizations." It even "sings" in the ultrasound portion of the spectrum. A.S. Feng and col- leagues have studied hours of tape re- cordings of these amphibian virtuosos and conclude:

> The frogs' vocal variety, including múltiple upward and downward sweeps of notes, are reminiscent of sounds made by birds, whales, and primates.

(Anonymous; "Singing Frog in China Evokes Whales, Primates," Science News, 162:173, 2002)

FISH

EXTERNAL APPEARANCE

FLASHY FISH

The Amazonian ángel ñsh, popular in aquariums, employs a Star Wars-like weapon in battling invaders of its terri- tory. The fíat sides and silvery acales of this species make highly efficient mir- rors. These fish have learned how to maneuver their bodies so aa to reflect bright flashes of sunlight directly into the eyes of their opponents. These intense bursts of light are often enough to burst blood vessels in the eyes of the target fish-----sometimes even stunning it. Pairs of Amazonian ángel fish have been observed flitting about in "light-fights" as they attempt to zap each other and avoid optical counterattacks.

(Anonymous; Creation/Ex Nihilo, 21:7, March-May 1999. Attributed to Sydney Morning Herald, October 13, 1998)

Comments. The use of light. as an offensive weapon is reminiscent of those dolphins that stun their prey with powerful pulses of sound.

Creation/Ex Nihilo is an Australian Creationist publication. It is easy to see why creationists focus on these light- fighting fish. Their weapons required the coevolution of fíat sides, silvery scales, and the complex instinetive be- havior needed for orienting their bodies relative to both the sun and their opponents .

WHY DO FLYING FISH HAVE SÜCH COLORFOL WINGS?

As he sailed tropical seas, A.D.G. Bell, in command of the ship Gandara, mused over this question:

> Apart from the ones which quite graphieally show the lift-off from the water, the other thing that interested me was the wing colouring of brown and yellow, and turquoise. I have noticed during passages around the World how the colours do apparently change, varying from almost translucent purple to a deep navy colour, and wonder how many other colourings of flying-fish wings have been reported.
>
> I think that flying fish are just taken for granted but perhaps if we looked at them more closely, then we may see some really weird and won- deful colours, especially in island areas. What does baffle me, is why, when the wings are only extended during flight, they should be of differing colours. I could understand it if they were a coral-swimming fish where the colours are designed to help them blend into the coral colours and so evade capture, but why the need in flight over crystal clear waters like the Coral Sea?

(Bell, A.D.G.; "...and Whether Fish Have Wings," Marine Observer, 64:136, 1994)

Comment. In other words, how do the bright colors, seen only in flight, increase the species' fitness and thus be explicable by the evolutionary paradigm?

SOME FÜNNY THINGS HAPPEN ON THE WAY ARODND THE WORLD

Weird things happen in the weightlessness of an orbiting spacecraft. In the many videos shot aboard the Space Shuttles, we are treated to tools, even gently oscillating globules of water, floating aimlessly in midair. Even stranger are the effects of microgravity on humans and other life forms.

Consider, for example, the medaka. This fish is the only vertébrate to have mated and laid eggs that developed into offspring in microgravity. Said offspring are doomed to Uves of somer- saulting swimming.

(Wassersug, Richard J.; "Life without Gravity," Nature, 401:758, 1999)

FROM THE DEPTHS OF THE AMAZON

Trawls lowered between 9 and 45 meters into the Amazon's muddy waters have brought up many bizarre fish never seen before. J. Lundberg and his team from the University of Arizona found two species of electric fish that subsist entirely on the tails of other electric fish. Some of the catfish are armor- plated; others are transparent; another catfish is only 8 millimeters (1/3 inch) long. Most interesting to taxonomists will be two sepárate species of electric fish that can be told apart only by the different patterns of electrical discharges they generate!

What will trawls capture in the Rio Negro which is about 100 meters deep in one place?

(Bille, Matthew A.; "Recent Discoveries: Fishing in South America," Exotic Zo- ology, 4:1, March/April 1997)

BEHAVIOR

BOAT-JUMPING FISH

We are not dealing here with those so-ealled "flying fish" that skitter and glide across tropical waters. Rather, _ the focus is on lar ge carp in the Missis- sippi that, for some unfathomed reason, have taken to jumping over the boats of fishermen. Not infrequently, they strike the boat's occupants. In one case, a 48- pound cai'p split the lip of a fisherman.

(Kilborn, Peter T.¡ "Giant Boat-Jumping Carp Isn't a Mississippi River Fish Story," Austin Ameriean-Statesman, August 26, 2002. Cr. D. Phelps)

Comment. Jumping Mississippi carp are not nearly as dangerous as the needle-fishes and half-beaks of tropical waters. These fish possess Sharp elongated beaks rather than the blunt heads of Mississippi carp. They are attracted to boats bearing lights at night and fre- quently leap over them. The houndfish is particularly dangerous. As long as 5 feet and weighing up to 10 pounds, they are formidable projectiles. Some night-fishermen have been impeled and even killed by ah—borne houndfish.

The fíat needlefish

WHY DO ELECTRIC FISH SWIM BACKWARDS?

This is not a trick question like the one about the chicken Crossing the road. To understand the answer to the electric fish puzzle, we must restrict the dis- cussion to those fish with active electric sensing systems. This group ineludes electric eels, South American knife fish, and African elephant snout fish. All of these have evolved, in a remarkable instance of parallel evolution, the capa- bility of generating pulses of electricity. These pulses (up to 1,000 per second) radíate through the surrounding water. Prey and other nearby objeets distort these oscillating electric fields. Electro- receptors on the fish and a sophisticated data processing system convert the field distortions into an "image" of the surroundings.

M. and S.J. Lannoo, of Ball State University, have watched the black ghost knife fish, which plies murky Ama- zon waters, approach likely prey tail first. Swimming backward using an elongated belly fin, the knife fish slowly

eruises past its potentiai victim. Jf the electrical image looks appetizing, the knife fish grabs its dinner with a for- ward lunge as it appears in front of it.

The researchers suggest that the fish swims past objects in. order to sean them with its electroreceptors. This is the only way the fish can identify prey because an electric sense eannot be focussed like an eye. But if the fish carried out its sean by swimming forwards, the prey would end up at its tail. The físh must swim baekwards to be in a posi- tion to eat the food.

(Day, Stephen; "Why Do Electric Fish Swim Baekwards?" New Seientist, p. 13, April 17, 1993)

TALENTS AND FACULTIES

ELECTRIC FISH NOT BACKWARD IN DATA PROCESSING

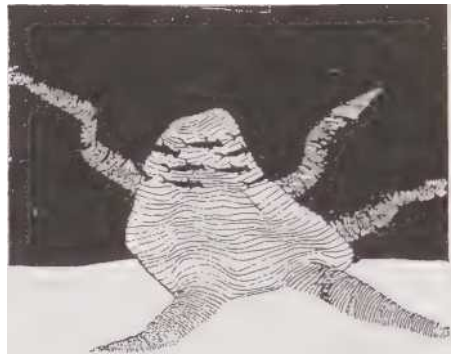
The incredible sophistication of the brain and nervous system of fish using active electric sensing is evident in the South American fish Eigenmannia. This fish (different from the knife fish above) emits electric pulses at frequencies be' twen 250 and 600 per second for electro- location and communication. M. Kawasaki, at the University of Virginia, has in- vestigated what happens when two of these fish operating on similar frequencies meet. Ordinarily, the fish would jam each other's sensory apparatus and "blind" each other. To circumvent this Eigenmannia has evolved a "jamming avoidance response," in which they both shift their pulse frequencies away from each other. To accomplish this, the fish must be able to detect time disparities between the two sets of signáis less than 1 microsecond long. Their individual electroreceptors are not cap able of handling such small time differences. Kawasaki has concluded that the jamming avoidance response can come only from highly sophisticated signal Processing in the fish's central nervous system.

(Kawasaki, Masashi; "Temporal Hyper- acuity in the Gymnotiform Electric Fish Eigenmannia," American Zoologist, 33:86, 1993)

Comment. Echo-locating bats and dol- phins also possess sophisticated data Processing apparatus for analyzing the echos they receive back from their prey and surroundings. It will be interesting to discover if evolution has come up with similar organic "componente" for handling acoustic and electric signáis. Further, we know that some inseets have developed ears and sound genera- tors to detect and jam hunting bats. Have the prey of electric fish evolved corresponding countermeasures? If not, why not?

THE MAGNETIC MOUNTAIN

To find the "magnetic mountain," you must venture out into the Gulf of Cali- fornia about 15 miles east of the Baja Península. Out there, beneath the boat, you can find a basaltic mountain named Espiritu Santo. Next, you don your face mask and descend toward the submerged peak. At about 70 feet, you will likely find yourself surrounded by scores, possibly hundreds, of sealloped hammer-



The undersea mountain Espirit Santo, the so-ealled "magnetic mountain," Ham- merheads are shown circling it, as are the "magnetic roads" the fish follow at feeding time.

heads, some as long as 13 feet. They will ignore you and the teeming fish as they slowly wheel passively ¿round the submerged mountain. Why do these big sharks congrégate in this spot? Marine biologists have been asking this for years. (vol. 1, p. 155)

A.P. Klimley and his colleagues de- cided to find the answer. First, by direct observation, they determined that the sharks' main purpose was not pro- creation, although some mating did oc- cur. Mainly, the hammerheads just idled away the daylight hours. At dusk, they disappeared. Klimley et al next implanted some sharks with transmitters and fol- lowed them at night. This was their feeding time, they swam 10-15 miles to deep waters where they gorged on squid. At daybreak, they were back drifting around Espiritu Santo. Apparently, the mountain was just a place to rest. But how did the hammerheads find their way back so unerringly? Furthermore, by ' tracking the tagged fish, the research- ers found the sharks often precisely fol- lowed the same paths in what seemed a featureless ocean. How did they do it?

It was quickly ruled out that they were followíng specific ocean currents or the bottom topography. The hammerheads seemed to possess some sort of unrecognized navigation sense. Suspect- ing they might be sensing the geomagne- tic field, Klimley began towing a magne- tometer behind the boat. Sure enough, the hammerheads were following paths coincident with fines of high magnetic gradient. And Espiritu Santo itself turned out to be a sort of magnetic beacon from which radiated these mag

netic "paths" that the hammerheads fol- 'owed so exactly. Now the question be- came: How do hammerheads----and per- haps other animáis-----sense such exceed- ingly small changes in the geomagnetic field?

Some birds and mammals do have small particles of magnetite in their bodies, but no one knows how they might be incorporated into a sensory organ. On the other hand, hammerheads and many other sharks are extraordinar- ily sensitive to electrical fields, respond- ing to fields as low as 10-° volt/centi- meter. Possibly the sharks' forward motion cuts the magnetic fines of forcé generating an electrical navigational signal. No one knows as yet. And so one mystery leads to another.

(Klimley, A. Peter; "Hammerhead City," Natural History, 104:33, October 1995)

Comment. Some marine biologists suspect that some deep-water whales and dol- phins inadvertently strand themselves while following magnetic "paths" like those radiating from Espiritu Santo.
(See vol. 1, p. 135)

BIOLOGICAL PF.ECURSORS OF THE 1995 KOBB EARTHQUAKE

The Japanese are meticulous observers of animáis. Many keep birds, inseets, fish, etc. as pets. When scientists at the Osaka City University asked for re- ports of unusual animal behavior around the time of the great January 17 quake, over 1,200 people in the Kobe-Osaka area carne forth with anecdotes. Some involved fish:

Fish rising to the surface in great numbers. At the port of Shioya, "mil- lions" of gizzard shad turned the sur- face of the water into silver.

(Minami, Shigehiko; "Creatures Went a Bit Batty, Maybe Knew Quake Was Corning," Asahi Evening News, February 25, 1995. Cr. N. Masuya)

ICHTHYOMETERS MEASURE POLLUTION

At the Centre International de l'Eau de Nancy, French scientists are putting the South American fish Apteronotus albifrons to work. This electric fish alters its self-generated electrical pulses as its aqueous environment changes. ■

Generally, when the fish is cruising around, it emits a continuous series of low-amplítude electric pulses at 1000 Hertz. But the researchers found that when the fish were exposed to certain pollutants in their holding tanks, the frequeney and form of the electrical signáis changed in charac- teristic ways that could be measured consistently. The electric fish, which are particularly responsive to potas- sium cyanide, phenols, and trichloro- ethylene, are soon expected to begin charging their way through French drinking-water treatment facilities.

(Anonymous; "Zapping through Pollution,' BioScience, 46:312, 1996)

DISTRIBUTION

LAKE VICTORIA'» CICHLED FISHES: CAN RANDOM MDTAXIONS EXPLAIN THEM?

Lake Victoria is Africa's largest lake (420 kilometers long, but only 69 meterá at its deepest). It is also the home of more than 300 species of cichlid fishes. Ordinarily, that number of different species would pose no problem for the biologists----look at the 400 or so species of hummingbirds in Central and South America! Lake Victoria, however, is a very young lake, and all of these cichlid fishes are endemic. Therefore, they must have evolved rather rapidly.

Recent seismic surveys of Lake Victoria and pistón cores from its deepest parts by T.C. Johnson et al have sur- prised everyone: Lake Victoria was completely dry 12,400 years ago. Ñor were there deeper "satellite" lakes that could have served as refuges for Lake Victoria's biota during extreme droughts. It is difficult to avoid the conclusión that the present-day 300+ species of cichlid fishes all evolved in less than 12,400 years,

This being so, can random mutations —the accepted source of evolutionary novelty----have generated so many new species in such a short time? That would be one new species every 40"years or so on the average.

(Johnson, Thomas C., et al; "Late Pleis- tocene Desiccation of Lake Victoria and Rapid Evolution of Cichlid Fishes," Science, 273:1091, 1996)

Comments. Of course, hybridization may have accelerated the evolution of the 300+ species. Perhaps "adaptive" or "purposeful" evolution might have sped up the process, but this latter concept ■—assuming it exists at all------is not at all understood and highly controversial. (For more on adaptive evolution, see: pp. 156 and 168 plus vol. 1, p. 180-181.

As Lake Victoria began filling up again after the Pleistocene drought, the many open niches must have resembled the situation on the Galápagos when the "pioneer" finches first arrived, took advantage of the many new opportunities for making a living and, as the story goes, evolved into the several species known as Darwin's finches.

CICHLIDS PDNCTUATE EQUILIBRIÜM

In those pesky cichlid fish of African lakes we may be seeing punctuated evolution during an actual punctuation.

Responding to the preceding article on the Lake Victoria cichlids, A. Mebane called our attention to Lake Malawi. While the Lake Victoria cichlids seem to have evolved a profusión of species in a space of about 12,500 years, those cichlids in Lake Malawi may have done the same in only a century or two.

T. Goldschmidt advances this even- more-abbreviated time scale in his book Darwin's Dreampond. In it, he discusses how the water level of Lake Malawi fell more than 120 meters during the 1800s —an exceptionally dry period in Africa. Today, the Lake is again high and once more host to isolated rocky islands, each with its own unique complement of cichlid fish; each island has species found nowhere else in the lake. Where did all these species come from, considering that their little islands were bone dry just a century ago? Goldschmidt writes:

> Cichlids that inhabited these exposed rocks would have suffocated, unless they had already left for wetter dimes. Yet today, species that do not exist anywhere else can be found near almost every rocky island. From an orthodox point of view, the most plausible explanation for this is quite surprising: many color forme as well as biological species developed over a period of less than two hundred years.

This is certainly explosive speeiation — real biological punctuation! But, perhaps as water levels fell, the original cichlids found refuges in surviving pools and then repopulated the lake when the waters rose. But is it reasonable to be- lieve that they all sorted themselves out so perfectly that many species are found nowhere else in the lake? The probabil- ity seems high that cichlid speeiation has been very rapid—too rapid, one would think for random mutation and the slow feedback of natural selection to accomplish this daunting task in just a century or two. Might there not be some additional nonsupernatural factor at work?

(Goldschmidt, Tijs; Darwin's Dreampond, Cambridge, 1996, p. 125)

THOSE STRANGE ANTARCTIC FISHES

In the frigid waters ringing the conti- nent of Antárctica live approximately 275 species of fishes, 95 of which are assigned to the suborder Notothenioidei. This particular group of fishes is re- nowned for its unusual adaptations, as outlined below by D. Policansky:

> Some of them have glycoprotein anti-freezes in their blood, some have no hemoglobin, some have so small a temperature tolerance that they die at temperatures above 4°C, some are neutrally buoyant despite lacking swim bladders, and some live as deep as 2950 meters. The suborder has no known fossils, largely because no bony feature—indeed, no single character of any sort—can be used to define it. How did these animáis arrive there, what are their ances-
>
> tors, how do they make a living in such an environment, and how can they support commercial harvests?

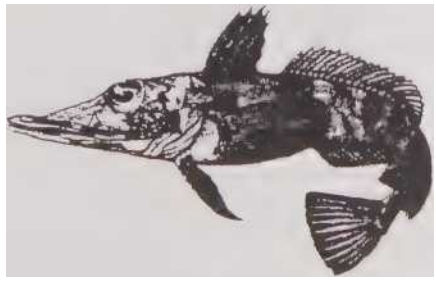
(Policansky, David; "Southernmost Fauna," Science, 264:1002, 1994)

Comments. Those species lacking hemo- globin in their blood are doubly per- plexing:

(1) Zoologists still do not know how sufficient oxygen is transported in these fishes, for what substitutes for normal blood seems inadequate;

(2) How could they have evolved from hemoglobin-carrying fishes? and

(3) Why switch from hemoglobin at all when other Antarctic fishes find it perfectly satisfactory?



A representativo Notothenioid fish from Antarctic -waters. (From: Antarctic Fish Biology, San Diego, 1993.)

ORGANS

DRAGON FISH SEE RED

Most fish that make a living in deep, dark ocean waters have eyes that are most sensitive to the blue part of the sun's rays (470-490 nanometers). These are the rays that penétrate to the grea- test depths in the sea. This adaptation to blue light means that deepsea fish have evolved visual pigments different from those of surface fish and land animáis. Visual pigments are complex Chemical compounds, and one must suppose that many, many random mutations took place before deepsea fish were able to manufacture visual pigments different from their relatives living near the sur- face. (Or did deepsea fish come first?)

But there is more to this story. Many dwellers in the black abysses generate their own light. They sport biolumines- cent organs so they can be seen by others of their own species and, in addi- tion, illuminate prey for easier capture. In another remarkable example of evolu- tionary convergence, these biolumines- cent organs emit light spectrally match- ing the eye sensitivity of deepsea fish!

So far, though, this story is not any more amazing that many others woven into evolution's fabric.

But suppose that a deviant species of deepsea fish upset this cosy status quo by evolving visual pigment and biolumi- nescent organs operating in a part of the electromagnetic spectrum that other deepsea fish could not perceive. It would be as if this species had radar but the others did not!

Well, three genera of dragón fish do have organs (photophores) that emit far- red light, and their eyes are corres- pondingly red-shifted by new visual pigments. Thus, these dragón fish can communicate with each other without being detected by other species. When hunting, they can prowl the depths with lights on, illuminating prey sur- reptitiously. Lab tests indícate that these dragón fish can detect a meal much father away than possible with their lateral-line sense.

(Partridge, Julián C., and Douglas, Ron H.; "Far-Red Sensitivity of Dragón Fish," Nature, 375:21, 1995)

Comment. Note that the innovative spec- tral shift had to occur synchronously in both eyes and biolumineseent organs to be useful; i.e., have survival valué.

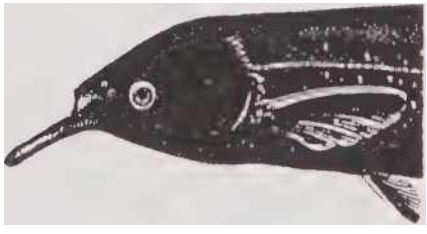
BRAINY FISH

In humans, the brain normally weighs aboutl/50th of the total body weight. The same ratio also holds for the higher anthropoids and (somewhat anomalously) for the squirrel monkey. With one fur- ther exception, the brain-to-body weight ratio is far less than 1:50.. The sur- prising exception is a group of fishes, the mormyrids. For these denizens of African rivers, the ratio is about 1:52. Many the mormyrids have very long, bizarre snouts terminating in tiny mouths. Some of these fish are capable of generating electrical fields about their bodies, probably for purposes of navigation and signalling.

Of what use are the outsized mormy- rid brains? Biologists suppose that these fish, which have to make a'living in waters that are almost opaque with suspended sediment, have developed en- hanced senses of smell and hearing. Their lateral sense organs, which are used in electro-navigation, are also weU-developed. The big brains of the mormyrids may be required to proeess all the data received their sense organs.

(Breder, Charles M., Jr.; "Fish with Super-Brains," New York Zoological Society, Bullatin, 42:15, 1939)

Comment. Perhaps so, but many other fish, particularly those living at great depths, also have to cope with darkness and yet do not have high brain-to-body weight ratios.



The elephant-nose or ubangi mormyrid. Actually, it is the fish's chin that projeéis outward rather than' its nose. (Adapted from: Encyclopedia of Fishes, New York, 1995.)

INTERSPECIES PHENOMENA

VAMPIRE FISH-----AN X-RATED ITEM

A tiny, transparent, still-nameless fish swimming in the Araguaia River in the Amazon Basin comes out at night to suck blood from its. victims. It wriggles into the orífices of animáis, anchors it- self with two hook-shaped teeth, and gorges on blood. The gills of other fish are its usual targets, but the orífices of other animáis, including humans, are fair game, too.

This Amazonian fish is only about 1 centimeter (less than *i* inch) long, mak- ing it smaller than the infamous candirus that threaten bathers in other South American streams. Once a candiru slith- ered into a cut on a researcher and could be seen wriggling under the skin toward a vein. Candirus also anchor themselves inside their victims' orífices, requiring surgical removal.

(Homewood, Brian; "Vampire Fish Show Their Teeth," New Scientist, p. 7, December 3, 1994)

SWIMMING DP THE WRONG STREAMS

Of course, most freshwater fish do swim upstream in the usual way, but not the candiru. It is partial to very specific streams.

This small, slim, scaleless species of catfish inhabits the Amazon where it preys on other fish, often by invading their güls and feasting on blood and tissue. They also aim much higher on evolution's ladder: they are the only known vertébrate parasites of humans.

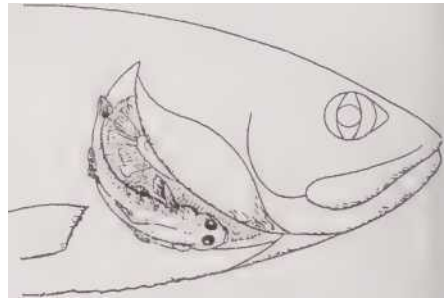
It is when they prey upon humans that they swim up the wrong streams— at least their victims think so! Their technique is simple. They detect human uriñe released by swimmers and follow it right to the source. They don’t stop there but inserí themselves right into the penis and keep going, sometimes all the way to the bladder. Once inside the penis they erect their spines and cannot be extracted except by surgery. Left alone, they are not only excruciating to the unwise bather but can eventually be fatal. Surgeons have successfully extracted them from the bladder, but in remóte areas penis amputation is the only answer!

(Warren, Nicholas; "In Mare Internum," Fortean Times, p. 14, September 1999. Title translation: "Within the Inner Sea.")

FISH TALES FROM THE MOÜTHS OF FISHES

Several species of fishes live inside the mouths and gills of larger species of fish. Some are true parasites. Attached by their teeth, they drink the blood of their hosts. Other fishes have fias that have been transformed into adhesive disks that allow them to also live inside the mouths and giU cavities of larger fish. These are true symbionts that feed on food scraps. The sizes and shapes of these invaders are neatly adapted to the mouths and cavities of each host. It is possible, but not easy, to explain how these remarkable physiological and be- havioral transformations were initiated and perfected via random mutations and natural selection.

(Gudger, E.W.; "Fishes That Live in the Mouths or Gül Cavities of Other Fishes," Scientific Monthly, 24:556, 1927)



A fish living within a fish. The shapes and sizes of such symbionts and parasites have evolved to fit their unusual niches.

E.W. Gudger, mentioned above, coUected aU sorts of piscine anomalies. He would have been delighted to learn of a ieaUy bizarre type of parasitism involving the spotted rose snapper (and probably other species) and a parasitic isopod (a relative of crabs and lobsters).

The isopod first invades the mouth of the host fish and then consumes its tongue. It then hooks itself into the place where the tongue used to be and, being about the same size and shape oí the consumed tongue, becomes in effect its replacement. The isopod afterward helps the host fish to hold its prey as if it were the real tongue. Its reward con- siste of tidbits from the fish's me al.

(Zimmer, Cari; "Attack and Counter- attack," Natural History, 109:44, September 2000)

ARTHROPODS

It may seem strange to lump insects, spiders and crustaceans together. After al 1, a butterfly doesn't look much like a king crab. But they are both arthropods *by virtue of their jointed feet.

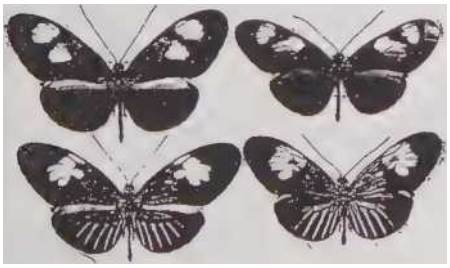
In external appearance, behavior, distribution, faculties, etc., the arthropods are incredibly diverse. Insect specíes alone number in the millions. Morphologies, evolutions, and habits are so wildly different among arthropods that anomalousness seems to lose its meaning. Nevertheless, we will persist with our standard outline and lump all of the diverse forms of these "animáis with jointed feet" together.

EXTERNAL APPEARANCE

THE URGE TO REPLICATE

The inside front cover of the March 1944 issue of BioScience displays five paire of colorful butterflies. Each member of each pair is virtually a duplícate of its partner in shape, design, and colore. Yet, each member of each pair is a different species. Although the pairs are from the same geographical regions, it is not obvious why this astounding mimicry should occur. Here, one cannot invoke the explanation that one species gains an evolutionary advantage by mimieking an unpalatable species, as with mimics of the Monarch Butterfly. That is, there seems to be no evolutionary advantage to loolring alike.

(Miller, Julie Ann; BioScience, inside front cover, March 1994. Miller's editorial remarks are based upon a later article by H.F. Nijhout, who also sup- plied the photographs. Nijhout's article explains how butterfly wicg patterns may have evolved.)



Butterfly mimicry. The horizontal pairs look alike but are of different species. Colors also match. (N.F. Nijhout)

Comment. Cases of remarkable mimicry also occur among geographically sepa- rated species. For example, the North American Meadowlarks are dead ringers for the African yellow-throated longclaw. "Convergent evolution" ñames the phenomenon but doesn't tell how or why long chains of random mutations can come up with the same designs where there seems to be no "guidance" by the forces of natural selection. Perhaps genomes contain "subprograms" for those patterns and structures often used in biology. Of course, Sheldrake's widely dismissed idea of "morphic reso- nance" could apply here!

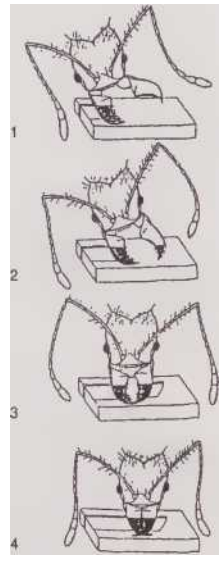
LEAF-CUTTING ANTS USE VIBRATING SHEARS

Leaf-cutting ants neatly excise penny- size pieces of leaves and tote them back to their fungus gardens. J. Tautz and colleagues, University of Wurtzburg, noted that the ants chirped as they sliced at the leaves with their jaws.
With a little instrumentation, they discovered that during each chirp both ant and leaf vibrated at about 1,000 hertz.

The vibration apparently rigidizes soft leaf tissues and makes them easier to cut. The same principie is UBed by biologists when they slice soft material for micro- scope examination. The leaf-cutting ants apparently invented the Vibratome millions of years ago! But how?

(Tautz, Jurgen, et al; "Use of a Sound-Based Vibratome by Leaf-Cutting Ants," Science, 267:84, 1995)

Comment. It is rather amazing that ants, viewed by most animal behaviorists as mere automatons, could parlay small random mutations into such a technically sophisticated technique.



The four stages of a leaf-cutter ant's bite. Each hite is accom- panied by an audible chirp and a vibration of the ant and the leaf.

BEHAVIOR

EUSOCIAL BEETLES

The best-known eusocial animáis are the ants, termites, and naked mole rats.
As biological observations accumulate, the eusocial phenomenon is being found elsewhere in the animal kingdom. The following quotation extends eusociality to the beetles and also provides a good technical definition of the term.

> **The weevil Austroplatyous incompertus lives in galleries in the heart- wood of Bucalyptus trees. Colonies are initiated by solitary fertilized females and, when mature, manifest the three phenomena which character- ize eusociality: overlapping genera- tions, cooperative brood care and división into reproductive and sterile (unfertilized) castes. Each colony contains one fertilized and five or so unfertilized adult females, the job of the second groupo being to deal with predators and to extend and maintain the galleries.**

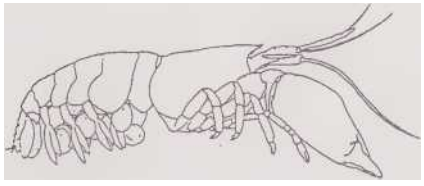
(Anonymous; "Sociable Beetles," Nature, 356:111 1992)

Comment. Eusociality is somewhat of a puzzle in evolutionary theory because one must ask how the phenomenon arises when it requires some individuáis to foreswear reproduction and thus give up the chance to pass their genes directly on to progeny. Explanations of such extreme altruism generally state that the nonbreeders are really helping to pass some (or even all) of their genes on by supporting the colony, for they are generally closely related to the breeding female.

But how to the nonbreeders know and act upon this rationale of the evolutionists?

HIGH SOCIAL ORDER IN A NEW ORDER

When divers explore the coral reefs off the coast of Belize, they hear a an underwater sound like frying bacon.
This sound emanates from the snapping claws of Synalpheus regalis, popularly called snapping shrimp. These diminutive crustaceans live in colonies in the chan- nels of sponges. The individual shrimp in these sponge-sheltered colonies are noi. all alike. The noise-makers are the "soldier" caste, whieh wield big "fighting claws." The "workers" that care for the young lack the large claws. All of the young shrimp are produced by a single "queen" shrimp, who is substantially larger than the soldiers and workers.
The snapping shrimp social order sounds a lot like that found in bee hives and termite mounds. The snapping shrimp are, in fact, "eusocial" like the social insects. They are the only known eu- soeial members of the Order Crustácea.



A soldier snapping shrimp with a huge fighting cíaw. Overall length: only about half an inch.

Eusociality is considered to be at the apex of animal social organization. What forces have fostered its development in three diverse groups-----insects, mammals (the naked mole-rats), and now the crus- taceans? How did the different castes evolve, especially the sterile castes?
It must have taken a lot of random mutations to develop such greatly different body forms in a coordinated way such that colonies were continuously viable!

Obviously, we have a lot to learn about these snapping shrimp. Are new colonies formed when sexual forms disperse, as with ants and termites; or are there "dispersive morphs" created, as with the naked mole-rats? (See p. 119.)

(Duffy, J. Emmett; "Eusociality in a Coral-Reef Shrimp," Nature, 381, 1996. Adler, T.; "A Shrimpy Find: Communal Crustaceans," Science News, 149:359, 1996)

KING CRAB CONGREGATIONS

King crabs, besides being delicious and big (often 6 feet aeross), can be very elusive, They come and go on schedules erratic enough to drive Alaskan crabbers crazy. However, sometimes a crabber will get rich fast when he comes upon a strange habit of this crustaeean:

> After a night of roaming, crabs often pile themselves into huge heaps, called pods. Some pods stretch hun- dreds of feet and contain thousands of crabs—"a mountain of crab," says C. Braxton Dew, a National Marine Fisheries diver and researcher, NLr. Dew was one of the first scien- tists to document the pod phenomenon, snapping underwater photos near Kodiak in 1993. The pod contained as many as 30,000 king crabs.

No one knows why the crabs congrégate in such huge numbers.

(Richards, Bill; "Crabs Come and Go, Leaving Fishermen of Bering Sea at a Loss," Wall Street Journal, June 26, 1995. Cr. J. Covey)

IT'S "SMOTHERS" NOT "PODS"

An Alaskan biologist writes that those large congregations of king crabs found in northern waters mentioned above are properly called "smothers." The term "pod" refers to family groups, such as those groups of oreas patrolling the British Columbia coast.

(Home, Seott; personal communication, January 26, 1996)

PROCESSIONARY CATERPILLARS

The caterpillars of several families of butterflies and moths travel head-to-tail in long lines when searching for new feeding sites. In rough terrain, these long Unes may actually double back on each other and link up to create proces- sionary circles that can persist uselessly for hours. The French naturaUst J.-H. Fabre once tested the determination of a of Une processionary caterpillars by joining the front and rear ends of the Une together. The circle slowly spun slowly around for seven days, breaking up only because of exhaustion and star- vation, even though Fabre had placed ampie' food nearby.

(Dpton, Murray, and Devers, John; "Caterpillar Traek," New Scientist, p. 95, June 1, 2002)

ANIMALS THAT ATTACK HUMAN TECHNO-LOGICAL INFRASTRUCTURE

We are accustomed to termites feasting on our homes' timbers and mice gnawing in the waUs, but in recent years many species have developed a taste for more sophisticated fare, especiaUy anything eleetrical, This propensity extends to the crustaceans. It has been reported that the land crabs on Tahiti bite through the eleetrical cables of film crews. Rarely are they electrocuted.

(Ager, Derek; "Unwary Animáis and Vicious Volts," New Scientist, p. 47, January 9, 1993)

ANTS LIKE MICROWAVES

Back in 1990, an item in Science Fron- tiers was titled "Ants Like Amps." (vol. 1, p. 160) The subject then was the strange mesmerizing effect eleetrical equipment has on ants. They dote on airport runway Ughts, household elec- trical meters and, in particular, elec- trical relays, where they may congrégate en masse.

Now, a decade later, we discover that they are also not adverse to ex- ploring microwave ovens—even when they are turned on!

We cannot explain the attraction of eleetrical relays, but we do know how ants survive in humming microwave ovens. It is because the microwaves inside the oven form standing waves.
Energy is high in some areas-------ants would fry there-----and weak elsewhere. Ants seem to be able to find these low-energy refuges and survive very nicely — perhaps on the food you were plan- ning to consume!

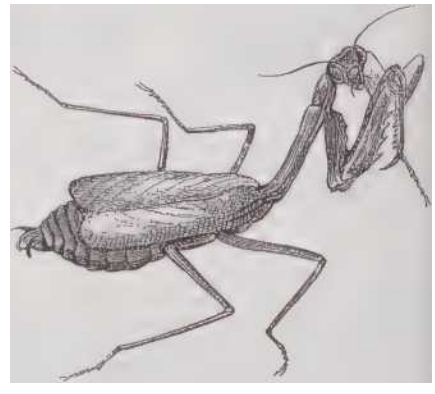
(Anonymous; "Them!" New Scientist, p. 109, July 31, 1999)

Comment. You can map your microwave's standing waves by fílling a fíat tray with marshmaUows. A pattern of toasted and untoasted marshmaUows wül appear post-zapping.

THE EARLY (AND PERSISTENT) INSECT CATCHES THE BIRD!

Ruby-throated hummingbirds are spunky üttle bundles of avian energy. They attack crows and hawks routinely, even though they weigh no more than three doUar biUs (about 3 grams). They are not weakUngs, for they cross the 800- kilometer (500-mile) Gulf of México non- stop. But they are, it must be admitted, so smaU that a burly insect might sub- due one. And this has happened at least once.

> Mrs. EUy Weirda of Rock HaU, Mary-land. was watching her hummingbird feeder when she noticed a large pray-ing mantis sitting on top of it. As ' the hummingbirds approached, it ap- peared as if the praying mantis was actually stalking them. This continued all day, but the hummingbirds safely eluded the elutehes of the praying mantis. When the praying mantis was stül on top of the hummingbird feeder the next day, Mrs. Weirda decided to capture the unusual activity on film. She quickly set up her camera and waited. As fate would have it. the praying mantis' persistence paid



A large praying mantis can snatch a l\ ummingbird from a feeder.

off. The unexpected did happen, and Mrs. Weirda captured the humming- bird's struggle on film. The amazing thing about this strange event is that the praying mantis consumed the entire hummingbird. Only a few feathers were left as witness to the struggle.

(Anonymous; '"Insect Tiger' Strikes Hummingbird," Wild Bird News, no. 5. September/October 1994)

STRANGE APPETITES

A Mom's Duty. The females of a small European spider, Amaurobius ferox, actively encourage their freshly hatched spiderlings to kill and eat them. The moms press against the clustered young solieiting what is called "matriphagy," or "mother-eating."

(Anonymous; "Having Mom for Dinner Natural History, 108:21, April 1999)

TALENTS AND CAPABILITIES

MONARCH COMPASS3S

Field experiments down the years sug- gest that migrating birds use a variety of strategies to chart their courses with high precisión. The geomagnetíc field, the sun, the stars, prominent landmarks, and even odors help guide them aeross the continents and open seas. But birds are considered highly evolved animáis so their sophisticated navigational tech- niques are not especially surprising.

Monarch butterflies, however, are mere insects, with tiny brains (naviga- tion-data processors) and not much in the way of the environment sensors and internal docks required for long-distance migration. Yet, some of these colorful insects manage to flutter up to 4,000 kilometers from the eastern U.S. and Cañada to their wintering grounds in México. How do they do this?

S.M. Perez et al have nów shown that monarch butterflies are equipped with a sun compass; that is, they chart their courses by noting the sun’s ehanging azimuth. This feat requires not only the measurement of solar azimuth but also reference to an internal dock. Humans cannot do this without artificial Instruments .

Furthermore, even on cloudy days, migrating monarchs fly in the proper direction (generally south-Southwest). Apparently, they also have evolved a backup navigation system, perhaps a geomagnetic compass.

(Perez, Sandra M., et al' "A Sun Compass in Monarch Butterflies," Nature, 387:29, 1997)

Comment. Somewhere in the tiny bodies of the monarchs are packed sun-azimuth sensors, internal docks, magnetic-field sensors, and a nervous system that converts the incoming data into signáis to the wings. Their genomes must also inelude map Information to pass on to their progeny.

The monarch butterfly is a far-traveller and —somehov—an excellent navigator. (From: D. Stockes: Observim Insect Lives, Boston, 1983, p. 234)

HORNETS INSTALE MAGNETIC MARKERS

Hornets of the species Yespa orientalis affix a tiny crystal of magnetic mineral in the roof of each of the brood-rearing cells in their nests. These crystals are roundish and about 0.1 millimeters in diameter. The mineral is ilmenite with this formula: FeTiC^.

The purpose of the magnetic crystals is obscure. The favored explanation is that the hornets use them as guides during nest construction-----sort of like those little flags human surveyors set out. This explanation assumes that hornets can somehow sense and make use of the complex magnetic field created by an array of many tiny magnets.

Another question asks where the magnetic crystals come from. Do the hornets secrete them like the magnetotactic bacteria or do they gather them from their environments?

(Stokroos, Ietse, et al; "Keystone-Like Crystals in Cells of Hornet Combs," Nature, 411:654, 2001)

Comment. It would be so easy to dismiss the hornets' little crystals as just one more animal gee-whiz fact, but we should not. Did the hornets first recognize that magnetic crystals would be useful to them and then set out to find some or , even more remarkably, evolve the ability to secrete them? Did their (presumed) magnetic sense evolve solely for the purpose of employing magnetic markers during nest building? There are more questions, but you get the idea.

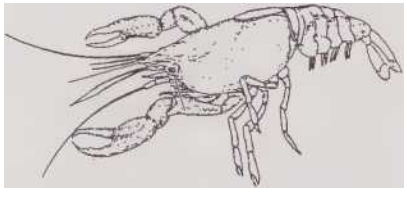
CRAYFISH COMMDNICATION

It always comes as a surprise when we find supposedly primitive organisms employing .our highly technical concepta; for example, the jamming-avoidance techniques of electric fish. (pp. 139-140) Still another potential example has been advanced: The lowly crayfish is now thought to enlist some of our sophisticated Information theory.

Crayfish often live in noisy environ- ments, where one would expect acousti- cal information transmission would be degraded. This would be true enough if linear information theory applied, but some, perhaps all, real situations are nonlinear. In such instances, information flow can actually be enhanced by the presence of optimized random noise. Stochastic resonance (SR) is the term applied in such cases of nonlinear statis- . tical dynamics. J.K. Douglass et al write:

> Although SR has recently been de- monstrated in several artificial physi- cal systems, it may also occur natural- ly, and an intriguing possibility is that biological systems have evolved the capability to exploit SR by opti- mizing endogenous sources of noise. Sensory systems are an obvious place to look for SR, as they excel at de- tecting weak signáis in a noisy environment. Here we demónstrate SR using external noise applied to crayfish mechanoreceptor cells. Our re- sults show that individual neurons can provide a physiological substrate for SR in sensory systems.

Put more simply, the crayfish nervous system has the potential for cashing in on SR in noisy environments. However, the authors also remark that humans, too, accordingly to psychological experiments, seem to harneas SR in the per- ception of ambiguous figures in noisy situations.



The crayfishes may use SR (Stochastic Resonance). See text.

(Douglass, John K., et al; l'Noise En- hancement of Information Transfer in Crayfish Mechanoreceptors by Stochastic Resonance," Nature, 365:337, 1993)

Comment. It appears that in humans and probably crayfish and other life forms, evolution via random mutation has just happened to have hit accidentally upon very sophisticated techniques for im- proving communication!

BIOLOGICA! PRECURSORS OF THE 1995 ROBE EARTHQUAKE

The Japanese are meticulous observers of animáis. Many keep birds, insects, fish, etc. as pets. When scientists at the Osaka City University asked for re- ports of unusual animal behavior around the time of the great January 17 quake, over 1,200 people in the Kobe-Osaka area carne forth with anecdotes. Two t>pical pre-quake observations of arthro- pods ***Viere:***

•Captive stag beetles and turtles emerging from hibernation.

•And strangest of all, silkworms and fish in ponds orienting themselves in the same directions.

(Minarai. Shigehikoj "Creatures Went a Bit Batty, Maybe Knew Quake Was Corning," Asahi Evening News, February 25, 1995. Cr. N. Masuya) ■

PSYCHIC MITES

We don't know if mites of the suborder Astigmata are diploid or haploid, but they put whatever chromosomes they have to good use. These tiny animáis hang out on the surfaees of bird feathers feasting on oils and fungi. But they dwell on dangerous terrains because most birds molt their feathers each year. Living on a wrong feather can be dis- astrous.

Since some birds molt their feathers in a certain sequence, some Spanish scientists have been able to track mite movements during molts. Somehow these mites sense the imminent loss of the feather they occupy and move with alacrity to safer feathers.

(Weir, Kirsten L.; "Mite Life," Natural History, 111:18, February 2002)

Comment. This is probably the same sense rats use when they flee a doomed ship!

CHEMISTRY

A STRANGELY SELECTIVE SP1DER

Australia's funnel web spider is one of the world's deadliest. Before an anti- venin became available, this Bpecies killed one human every four years. It is not this low death rate that impels us to mention this spider. It is because the bite of the funnel web is deadly only to insects and humans. All other mammals are said to be immune. Analysis of the venom yields the remarkable fact that it consiste of 45 active compounds. One of these is specific to insect brain eells; another, to human nerve cells.

(da Silva, Wilson; "Spider Gives Kiss of Death to Pests," New Scientist, p. 23, May 17, 1997.)

Comment. Sínce humans are not on the funnel web's menú, it must be only a eoincidence that its venom kills people so selectively. It would be nice to know it ehimps, gorillas, and orangs really are immune.

STRANGELY SELECTIVE CONE SHELLS

A phenomenon similar to that seen in the venom of the funnel-web spider (above) also occurs in cone shells. These snails are aetually much more dangerous to humans than the spider, particularly naive shell collectors. Their venoms are extraordinarily complex and contain hun- dreds, perhaps thousands, of different toxins. Many of these are specific to potential prey. Once again, humans are not on the normal menú but are included in the armory anyway.

(Concar, David; "Doctor Snail," New Scientist, p. 26, October 19, 1996)

Comment. Both cone shells and the funnel web spider seem to possess venom factories cap able of concocting wide ranges of toxins, even though some are of no practical use. Whence this amazing versatility in sophisticated Chemical synthesis; how did these extraordinary glandular factories evolve?

ORGANS

CRAB EYES WITH NAKED RETINAS

At the deep-sea vents, light emitted by the gushing, hot fluids is extremely weak and also spectrally shifted from the light in the sur face waters illumina- ted by the sun. Some animáis making their living around these vents have attuned their eyes accordingly in remarkable ways.

The larval forms of one crab species and one shrimp species, both destined to live adult lives at the vents, pass their youth in the plankton 1,000 meters above the vents and often 100 kilometers away. These larval forms possess image-forming eyes that are most sensitive to the bluish light pervading that portion of the ocean. As adulthood approaches they discard their eyes' lenses, trading in this man- ner their image-forming capability for greater sensitivity to light.

More amazingly, the visual pigments in the now-naked retinas chemieally change so that they are now most sensitive to tho longer wavelengths prevailing around the deep-sea vents.

These changes represent a remarkable metamorphosis—one almost as pro- found as that from Caterpillar to butter- fly.

(Jinks, Robert N., et al; "Adaptive Visual Metamorphosis in a Deep-Sea Hydrothermal Vent Crab," Nature, 420: 68, 2002. Land, Michael F.; "What Is a Naked Retina Good For?" Nature, 420: 30, 2002)

SOME SHRIMP SEE SPACIOÜS SPECTRDM

The eyes of the mantis shrimp are not only stereos copie but are endowed with 16 visual pigments, some are ultraviolet sensitive. Humans are not nearly as advanced with only three visual pigments.

(Summers, Adam; "Hairy Noses," Natural History, 111:70, February 2002)

Comment. Most mammals, though get along with only two visual pigments.
Most birds do a little better with five.
(p. 134) Do the mantis shrimp's eyes represent evolutionary overshoot? Why do they need to see so much of the spectrum? It's analogous the those pretty but deadly cone shells that can synthesize over 100 different potent venoms.

LOOKING BACKWARD WITH GENITAL PHOTORECEPTORS

Photoreceptors are sensitive to light but do not produce images like eyes do. They are found in many groups of animáis. Even humans possess photoreceptors in addition to their eyes; specifi- cally, in the pineal gland and, perhaps, the knees. (p. 109) The pineal gland (our "third eye") may have registered photons at some stage in our evolution, but it is now useless or adapted to other purposes. ■

The arthropods, however, still find photoreceptors useful. Crayfish have them on their abdomens, where they. initiate an escape response when illumi- nated. Additionally, the blind shrimp that collect around the glowing deep-sea vents have photoreceptors perched on their backs, presumably to guide them to their prey located around the lumi- nous vents.

Recently, the Japanese yellow swallow-tail butterflies were discovered to sport photoreceptors on their genitalia. These ■ are used during mating to confirm the position of the female's ovipositor-.

(Arikawa, Kentaro; "Hindsight of Butterflies," BioScience, 51:219, 2001)

FIRE-DETECTING BEETLES

The beetle Melanophila acuminata seeks out forests that have just been ravaged by fires so that it can lay its eggs in the nutritious, freshly burnt wood.
These insects are capable of detecting fires up to 32 kilometers (20 miles) dis- tant. They do not "see" the fire with their eyes but instead detect the thermal (infrared) radiation with a special organ on their chests.

(Schmitz, Helmut, et al; "Infrared Detection in a Beetle," Nature, 386:773, 1997)

Comment. The evolutionary scenario of this "special organ" will be difficult to woi'k out!

GENETICS

FRUITFLY SPERM ARE IMMENSE

Fruitflies smaller than a tomato seed pro- duce .sperm almost 6 centimeters (2.3 inches) long. These can be seen coiled up in the tiny fertilized eggs. Why so long? Perhaps they carry nourishment for the developing embryo.

(Boyce, Nell; "Monster Sperm," New Scientist, p. 40, April 11, 1998)

HAPLOID MITES

The false spider mite is the only animal known to make a living carrying only a single set of chromosomes. Both sexes are "haploid." Humans and all other animáis are "diploid," with two sets of chromosomes- -as far as we know.

(Muir, Hazel; "Mighty Mite," New Scientist . p. 20, July 7, 2001)

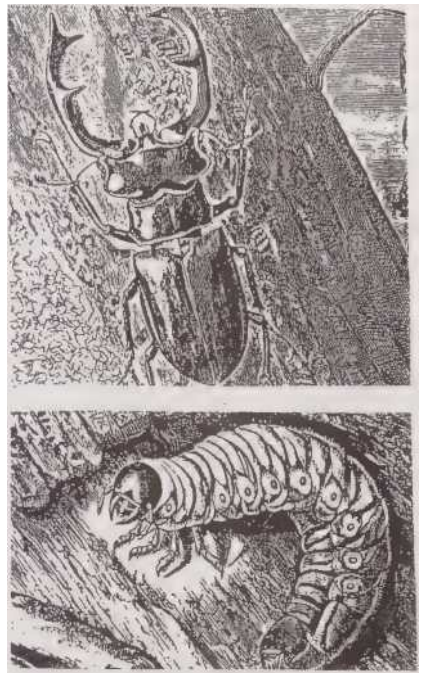
Comment. Some plante, such as bananas, are "triploid"; that is, three sets of chromosomes. This is strange, to say the least.

Inserted comment. Van Valen is saying that three evolutionary Trees of Life can be drawn from adult morphology, DNA structure, and larval morphology, and that they may not look the same. Caterpillars may yield a family tree different from that inferred from the butterflies. Which is correct, or are they all correct?

Back to the review. Waxing heretical, Williamson points out that an organism may have more than one phylogeny I Larvae may have ancestries different from the adults. How heretical can one get? But in the ocean, spermatozoa often cannot find an egg of the correct spe- cies. They may then fertilize eggs of a distantly related species. In such "wide hybrids," the larvae may resemble one parent and the adults the other.

There is much more. The gist of it all is that evolution has been much more than random mutation and natural selec- tion. Hybridization and outright mergers (endosymbiosis) have played important roles. Even our own cells harbor mito- chondria that have their own DNA. They are probably bacterial invaders that long ago settled down in the cells of our ancestors.

(Van Valen, Leigh M.; "Anomalous Larvae and the Burning of Heretics," Evolutionary Theory, 10:279, 1994. Cr. K.L. Partain)



Adult and larval stages of a stag beetle Could these radically different forms of the same species have had sepárate and different evolutionary histories?

EVOLUTION

ANOMALOUS LARVAE AND THE BDRNING OF HERETICS

Our title comes from L. Van Valen's review of a book by D.I. Williamson entitled Larvae and Evolution: Toward a New Biology. We can only touch upon a few of the many profound anomalies raised by the book. We begin with a paragraph from Van Valen's review:

> Williamson has given us a new set of anomalies. Mostly he does this by showing that what we know doesn't fit together as well as we thought it did. In particular, the major phylo- geny of the animal kingdom as esti- mated from adult characters doesn't fir very well with that estimated from larvae. Such a discrepancy for differ- ent stages has occasionally been re- ported within families of insects, and it has an apparent resemblance to the discordance occasionally found be- tween phylogenies inferred from morphological and molecular characters. In such cases, the usual conclusión (I ignore data chauvinista) is that we should somehow use all the available information to infer the correct phylogeny. After all, there was just one real phylogeny that oc- curred in the past, and we want to find it as closely as we can.

INVERTEBRATES

EXTERNAL

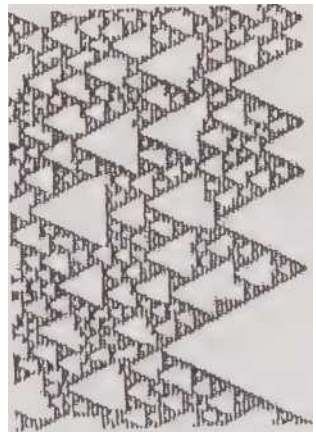
THE ALGORITHMIC BEAUTY OF SEASHELLS

Most will admit that many seashells are pretty, but how did all those colors and geometrical markings arise? Perhaps a more profound question is: Why do seashells need to be pretty in the first place? After all, moBt (but not all) of the shell owners do not have eyes with which to appreciate their handiwork!

HDwever, mathematicians and Computer modellers do have eyes. They have also had a lot of fun and some success in devising algorithmB (mathematical meth- ods) for the generation of seashell markings. In fact, our title above is also the title of a new book by H. Mein- hardt, which suggests how a suite of simple biochemical processes can create those shells coveted by collectors.

Meinhardt has devised equations that describe Chemical factors that turn pig- ment-generating cells on and off. In its simplest form, a mathematically modelled seashell is a two-dimensional sheet that grows along only one edge. Cells on this edge may or may not secrete pig- ment depending upon Chemical "influ- ences." B. Hayes describes how this sort of model operates:

> Given this generating mechanism, some shell patterns are easy to under-



The triangular pattern on Cymbiola innexa suggest the presence of a "global control element" that turns the pigment-secreting cells on and off in the correct order to create specific shell patterns and colors— something like a computer-controlled loom!

stand. A series of vertical stripes------- that is, stripes running perpendicular to the growing edge----------implies a static distribution of pigment- secreting celis in the mantle margin. Where a cell or group of cells is per- manently turned on, there is a dark stripe of pigment, and where the cells are dormant, there is an unpig- mented space. The complementary pattern—horizontal stripes, parallel to the growing edge—results from a temporal rather than a spatial oscil- lation. All the secretory cells turn off and on in synchrony, so that light and dark bands are left behind on the surface of the shell as the growing edge moves on.

All well and good, but some seashells have intricate patterns that require modellers to imagine traveling waves of excitation, oscülating Chemical systems, signáis that travel faster than Chemical diffusión, and long-range synchrony employing a "global control element." These pattern-generating schemes are clever and rather successful on the theoretical level. Indeed, the seashell modellers are rather smug about their accomplishments.

(Hayes, Brian; "Space-Time on a Seashell," American Scientist, 83:214, 1995)

Comment. The seashell modellers, of course, do not have to explain how or why "global control elements" evolved. The biological rendering of "long-range synchrony" is left unexplained. Al- though humana will pay large sums for intricately patterned seashells, the anomalist must ask why these patterns exist at all? Why are they beautiful?
Of what use are the patterns to the seashell inhabitants who cannot appreciate them?

DISTRIBUTION

DEPTHS OF IGNORANCE

Oceanographers have been heard to com- plain that Science knows more about the surface of Mars than it does about the topography of the deep ocean floors. Marine biologists, however, have even more reason to feel slighted. To illus- trate, the usual picture painted of the abyssal terrain beyond the continental shelves and slopes is one a a frigid biological desert—endless plains of sterile muck, broken once in a while by oasis-like deepsea vents, where weird tube worms thrive amidst clouds of ehemosynthetic bacteria. This is a highly misleading portrayal.

The situation, in fact, recalls what happened when biologists first released clouds of insecticides in rain forest canopies, thus precipitating a deluge of uncataloged insects into collecting nets waiting below. Now, instead of a mere million species of insects worldwide, entomologista are thinking perhaps 10 milhon or more. Will the same diversity prevail in the deepsea muck? C.L. Van Dover believes so:

> Away from the vents, in the great ocean plains, life is much less dramatic and often scaled down to minute proportions----threadlike worms, tiny snails, delicate, transparent clams. Yet, the diversity of animáis in the coid abyssal muds, it now appears, may rival the eelebrated biodiversity of the tropical rain forests.

We now know virtually nothing about this fauna, how it survives, and how it evolved. Millions of undescribed species may be awaiting discovery by research submersibles and deep dredging.

(Van Dover, Cindy Lee; "Depths of Ignorance," Discover, 14:37, Septeraber 1993)

Comment. Preconceptions about life and its talents have often blinded Science as to the extent of life's domains. More revelations are sure to come when biologists begin looking at crevicular life— those multitudinous species prospering in the earth's deep pores and erevices, where they draw energy from the earth's heat and Chemicals.

EVEN DEEPER IGNORANCE

A second report underscores the mys- tery presented by the unexpected diversity of life in the deep-sea ooze. J.D. Gage and R.M. May ponder in Nature:

> Why there should be such exuberant biological diversity in an environment apparently lacking in the habitat complexity of, say, tropical rain forest ---------whose species richness it might rival---remains an enigma.

In fact, the enigma becomes more profound when one finds there exists a "depth effect" paralleling the terrestrial "altitude effect."

> This phenomenon is associated with an increase in species richness with depth, and is essentially like the pattern of increasing numbers of plant and animal species as one moves down from mountain tops to sea level.

This "depth effect" is just the oppo- site of what one would expect as one descends into the ever blacker, ever colder, higher-ambient-pressure environment. The cause(s) of this increasing biological diversity eludes us.

(Gage, John D., and May, Robert M.; "A Dip into the Deep Seas," Nature, 365:609, 1993)

FROM DUST UNTO ABYSSAL MUD

We know the Creator made at least one species from dust, but ocean-floor mud has turned out to have more biodiversity. Twenty years ago, biologists put the number of species at about 1 million. Then, they started shaking and gassing rain-forest canopies. The rain of new insect species that fell to the ground made them revise the estímate to 30 million. The latest, long-unappreciated reservoir of undescribed species is mud oceanic mud. In particular, we know that the mud in the Rockall Trench off the western coast of Scotland teems with untold species of diminutive nematodes. Of course, nematodes are not as pretty as birds and fish, but they are never- theless bona fide species of life. Exami- nation of the Rockall mud and that from other seabed sites has convinced the nematode counters that there may be as many as 100 million nematode species on our planet. When other classes of life are added, the figure rises to at least 130 million.

(Pearce, Fred; "Rockall Mud Rieher than Rainforest," New Scientist, p. 8, Sep- tember 16, 1995)

Comments. Lifeless moleculés can apparently unite to form an almost infinite array of life forms! The next reservoir of unexplored biodiversity may be the crevicular realm-----all those fluid-filled erevices and channels that extend miles down into the earth's crust. They are full of bacteria and other unrecognized microscopic life forms. (vol. 1, p. 184) As for extraterrestrial habitats, who can even guess?

WHALE FALLS: STEPPING STONES ACROSS THE OCEAN ABYSSES

Uñique biological communities flourish at widely separated "oases" on the deepsea floors, where hydrothermal vents supply the energy and Chemicals neces- sary for life. Here are found free-living bacteria, tube worms, molluses, and several other species that prosper without the benefit of photosynthesis. These ehemosynthetic, thermal-vent communities are separated by thousands of kilo- meters of sea-floor "desert." Yet, the species involved are similar worldwide and must, at some time, have crossed these wide, forbidding expanses.

One possible meehanism for this mysterious dispersión carne in 1987, when the research submersible Alvin chanced upon the remains of a 21-meter whale at a depth of 1,240 meters off California's coast. The whale's skeleton was covered with bacterial mats like those at the hydrothermal vents. Also sustained by the carcass were mussels, snails, and worms; all in all, a community much like those at the vents. Furthermore, many of the species partaking of the whale's energy and Chemical resources are not normally found in that part of the Pacific. Subsequently, more "whale falls" with attached biological communities were found elsewhere. Calculations suggest that whale falls are more common that one might suppose—perhaps oecurring with average spacings pf only 25 kilo- meters. They could very well be the stepping stones that allow hydrothermal vent communities to disperse across the abyssal deserts.

(Smith, Craig R.; "Whale Falls," Oee- anus, 35:74, Fall 1992)

SHIP FALLS: SUPPLEMENTS TO WHALE FALLS?

> Strange tube worms up to six feet long have been discovered off the Spanish coast, dining on the hydro- gen sulphide from rotting beans [beams?] in the hold of a ship that sank 13 years ago. Lacking mouth,

gut and anua, they rely on bacteria to process the nutriente in minerals and dissolved in sea water. They had been found previously in the Pacific and the Gulf of México. It was thought they liked to live in huge colonies around cracks in the ocean floor where hot, mineral-rich lava pours out and areas where oil and gas leak from the seabed.

(Anonymous; "Gas Guzzlers," Fortean Times, p. 19, no. 68, 1993. Vía Daily Telegraph, June 22, 1992)

FACULTIES

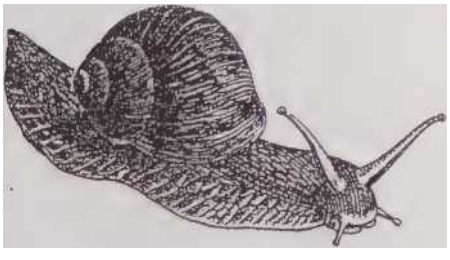
SNAIL-TRAIL TALE

Homing pigeons home for sure. Many mammals, possibly even humana,' also possess a homing instinct. But snails? Taxonomically lowly molluscs? But read this letter to the London Times.

> For ten days I have tried to banish a large snail which threatens soon-to- emerge seedlings. Each day the snail gets lobbed into long gráss of a near- by p addock and each night it quits the paddock, crosses a concrete driveway and returns to lurk under its favourite rock. There is no question of mistaken identity because its shell was marked with white paint after the first return trip.

(Roberts, M.I.L.; "Snail Tale," London Times, May 21, 1999. Cr. A.C.A. Sük)

References. Human homing capabilities (Biological Anomalies: Humane I); other mammals (Mammals 1); birds (Biological Anomalies: Birds).



A snail heading home! But haw does it knaw its way?

BODILY FUNCTIONS

SPERM TRANSPORTERS

In the last issue (p. 121), we related how sperm may join together in trains so as to increase their collective speed toward their fated destination: the fe- male's eggs. The sperm that swam the fastest usually have the best chance of fertilizing that egg.

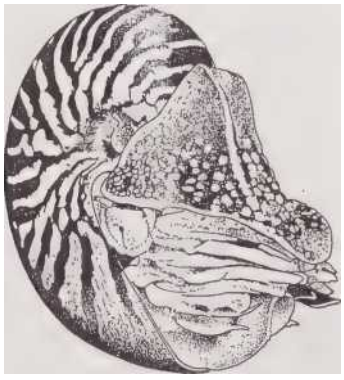
But why swim when you can ride? Let a vehicle speed you to your destination ---------hopefully outracing competing vehicles released by other males.

The subject species is the blanket octopus that makes its living just off Australia's Great Barrier Reef. The male of this species is only the size of a jelly bean. The female is a monster 40,000 times the size of the male. In mating, the male is essentially a non- participant physically speaking. As he approaches the female, one of his eight arms breaks off. It is loaded with sperm and, on its own power, it crawls into the female's gilí cavity—in eBsence we have a self-propelled sperm transporter.

Scientists have collected female blanket octopuses earrying múltiple, "still-living," sperm-laden male arms inside them.

(Holden, Constance, ed.; "Octopus as Extremist," Science, 298:531, 2002.)

Comment. In their propulsión phase, the self-propelled octopus arms are analogous to the detachable tails of lizards that autonomously thrash away to lure predators away from their real target.



One of the nautiluses.

intimacy. It's sex at a distance. His spermatophore-bearing fentacle detaches itself from the body and swims—under its own power—to the female, being in effect a swimming penis.

Just how this peculiar arrangement evolved is anyone's guess. Perhaps it has something to do with the fací that the female paper nautilus still retains a molluscan shell, while the male has lost this armor and looks more like an aspiring octopus. Without a shelly de- fense, the male may not want to get too cióse to the female!

(Anonymous; "The Shell of Aphrodite," Nature, 391:550, 1998)

*Apologies to O.W. Holmes for using his words in this racy context.

K1NKY SEX AMONG THE INVERTEBRATES

We suspect that the following two Ítems may embarrase some, but they are too weird and amusing to ignore.

Love's arrow. Or, rather, love's giant hypodermic needle. Cupid's arrows are rather benign compared with those of some squid. Some small squid will use their sharp beaks or tentacle hooks to rip open the skin of females. They then inserí spermatophores with their penises. In the giant squid, however, the male's penis is formidable, muscular, and al— most a meter long. It is powerful enough to inserí spermatophores directly under the skin of the females. The males are not always accurate, for males them- selves are sometimes impregnated in this roanner during the squids' deep-sea orgies.

(Norman, Mark D., and Lu, C.C.; "Sex in Giant Squid," Nature, 389:683, 1997)

The free-style penis. In the octopus and many cephalopods, the males have a special tentacle with which they inserí their spermatophores under the mantle of the female. The tentacle is then retracted for future use.

The male paper nautilus is more proflígate with its tentacles. The paper nautilus is cephalopod which, Üke its cousin, the chambered nautilus, "salís the unshadowed main."* When the male detecta a receptivo female, he avoids

IS ÍMMORTALITY ONLY A MUTATION AWAY?

Here follows the lead sentence of the abstract of a recent letter to Nature:

> We have found that mutations in the gene daf-2 can cause fertile, active adult Caenorhabditis elegans herma- phrodites to live more than twice as long as wild type.

(Kenyon, Cynthia, et al; "A C. elegans Mutant That Lives Twice as Long as Wild Type," Nature, 366:461, 1993)

Comment. C, elegans is a roundworm only about a millimeter long. Roughly a thousand cells make up its tiny body, and scientists have charted the birth and death of each cell from egg to adult. This roundworm's life is a mosaic of changing cells, as some die to make way for new cells with differenf agendas. Somehow this programmed sequence of cell death and birth can be slowed down by mutations and thus increase longevity.

Wouldn't any mortal speculate that perhaps human longevity might, like that of C. elegans, be extended by modern gene manipulators? Sure, it's quite an extíapolation from roundworm to human, but our cells are programmed just like those of C. elegans. Change a gene here and there, and we might all live as long as Noah!

ORGANS

A SQOID'S EYES THAT LOOR OP AND DOWN

ñquids are molluscs, and like many of their shell-enclosed brethren they have some rather eomplex eyes. In fact, their eyes are much like those of vertebrates in many respecta.

A species of jewel squid has innovated further eyewise. It possesses a huge left eye that looks upward to spot prey against the bright backdrop of the sur- face, plus a much smaller right eye that only peers downward into the depths on the watch for predators. Said predators are, of course, also looking upwards trying to see the dark shapes of the squid!

(Holden, Constance, ed.; "News of the Weird," Science, 301:43, 2003.)

Comment ■ We would not be surprised to learn that each of the jewel squid's eyes has a different spectral response " to better see in the two different visual environments.

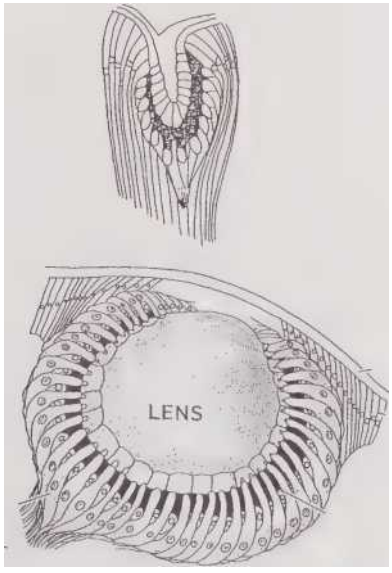
COMPOUND EYES IN BUROWING WORMS

When eyed animáis take up residence in dark environments, their eyes, now unnecessary, usually atrophy and frequently disappear completely. In the lore of evolution: "Use it or lose it."

But some annelid worms, such as the familiar earthworm, are covered with minute compound eyes, for which, being burrowers, they would seem to have no use. Furthermore, they have retained these eyes 100 million years or so. In contrast, cave fish seem to have lost their power of sight very quickly as tlny took up their new residences.

Why has natural selection not eliminated these useless, energy-consuming features in burrowing worms?

(Graham, James; "Twenty-Five Problems Not Solved by Conventional Evolutionary Theory," unpublished paper, 2002)



The rves of annelid worms range from simple pits containing photoreceptors (top) to pigment cups with lenses (bottom). That such "simple" animáis have such sophtsticated eyes is remarkable. (From: R.C. and G.J. Brusca; Invertebrates, Sunderland, 1990)

PALEONTOLOGICAL PROBLEMS

DID DARWIN GET IT ALL RIGHT?

Believe it or not, the above title ap- peared in Science rather than the Creation Research Society Quarterly.
(We never thought we'd see the day!)
And right beneath, in large type, is:

> The most thorough study yet of species formation in the fossil record confirms that new species appear with a most un-Darwinian abruptness after long periods of stability.

In the article that follows, R.A Kerr reviews several recent studies of fossil bryozoans and snails. Some of these painstaking dissections of the fossil record were carried out by scientists initially eommitted to Darwinian gradual- ism. Even these researchers have been foreed to acknowledge that much biologi- cal evolution proceeds not in minute steps but by large jumps or saltatlons. Such abrupt speciation is tough enough to explain, but even more daunting are those species untouched by change over millions, even hundreds of millions of years. Indeed, the major characteristic of the fossil record and, therefore, earth üfe as a whole, has been stasis rather than speciation, despite all manner of asteroid impacts and climatic traumas. Nevertheless, many biologists think that species are somehow frozen in time by environmental forces that keep them from straying from their little niches.
This being so, paleontologist D. Jablon- ski, University of Chicago, asks:

> If stability is the rule, how do you get large-scale shifts in morphology?
>
> How do you get from funny little Mesozoic mammals to horses and whales? From Archaeopteryx to hummingbirds?

(Kerr, Richard A.; "Did Darwin Get It All Right?" Science, 267:1421, 1995)

Comments. [1 2]

(1) The reality of sudden saltations in the fossil record or "punctuated equilibrium" implies that those unfound transitional fossils beloved by the gradualists are truly missmg.

(2) The higher the taxonomic level, the more silent the fossil record. There are few elues as to how the major divi- sions of life (the phylla) originated.

INTERSPECIES PHENOMENA

SPONGING ON SPONGES

At the seafood restaurant, many diners dote on shrimp, the larger they are the better. But the overwhelming number of shrimp in the sea never grace our tables because they are weH-hidden from predators. They live their entire lives in the channels that riddle sponges. Snor- kelers may float past giant reef sponges without suspecting that these porous masses may harbor hundreds of shrimp, some no larger than rice grains.

Of the many varied social contraéis between sponges and shrimp, two are especially interesting to anomalists.

The flrst sponge-shrimp contract is one-sided. Some of the many species of snapping shrimp parasitize sponges.
They range through the sponge channels scraping sustenance off the waUs and give nothing in return. What makes this menage interesting is that some of the snapping shrimp species are eusocial; that is, they have an egg-laying queen, a dominant male, and a supporting cast of non-breeding shrimp. Sponges infect- ed by these shrimp are like beehives or termite mounds—except that they are alive. Another difference that intrigues biologists is that the non-breeding shrimp are all brothers bearing two sets of chromosomes, whereas in the beehives the workers are all sisters with just one set of chromosomes.

Darwin wondered at length about eusociality. Why do . only one female and one male breed? How did worker sterility evolve?

This article's author poses another riddle: Why did oniy a very few of the very many species of sponge-dwelling snapping shrimp develop eusociality?

(Duffy, J. Emmett; "Underwater Urban- ites," Natural History, 112:40, Decem- ber 2003)

The second sponge-shrimp social contract is more equitable. The sponge in this instance (genus Eupleetella) attracts attention of biologists and engineers be- cause it manufactures an array of high- quality light pipes; that is, light-trans-

The arrow points to the light pipes grown by the sponge úuplectella Unlike plant light pipes, these of this sponge transmit light outward.

mitting glassy ñbers.

The question asked is: Why do these sponges need light pipes since they are not bioluminescent? Ñor do they support algae that could use the light for photo- synthesis. Instead, these sponges are each home to a pair of luminescent shrirap. The shrimp's light is conducted outward through the light pipes, thereby attracting small denizens of the reef which are captured and consumed by the shrimp. The sponges beneñt by feeding off the wastes left by the shrimp.

The conundrum here is how to eon- struct an evolutionary scenario in which the sponges are impelled to synthesize light pipes (not an easy Chemical task) they don't need until two shrimp of a specific species take up residence.

(Anonymous; "Channeling Light in the Deep Sea," Science News, 164:190, 2003. Weiss, P.j "Illuminating," Science News, 164:303, 2003)

PLANTS AND FUNGI

A few words on biológica! classification are in order here. The above title combines two well-separated divisions of terrestrial life. Hidden in the text below is a third división: the so called "protists" that con- stitute the Kingdom Protista. Most algae are now classified as protists, but we inelude them here with the plants — as was customary years ago.

The digests that follow will demónstrate that, quite contrary. to our usual conception of plants, these organjsms are far from defenseless and are not at all "blind" to environmental variables. Plant sensors (organs) are not as visibly obvious as they are in animáis, but there is no doubt that plants can detect light (including colors), odors, touch, and even sound.

EXTERNAL APPEARANCE

A BOON TO THE LUMBER INDUSTRY?

R. Oldfield and her husband were visi- ting Panama, when they heard about un- usual trees growing at the Summit Botanical Garden and Zoo just outside Panama City. They decided to take a look and were soon walking along a slip- pery, narrow trail.

> After a short walk the trail ended abruptly. There was a sign that pointed to a group of trees. It said "árbol cuadrado" (square tree). From a distance, they didn't look square. I was disappointed. My husband made a closer inspection. He put a field guide against the trunk of one tree. It was totally square.
>
> Later I found that the square trees were a member pf the banyan family and grow only in this area of El Valle. Why they are square is still a mystery.

(Oldfield, Rochelle; "Panama's Gold Frogs and Square Trees," International Travel News, 21:20, June 1996)

Comment. There's a lot of waste at the sawmill when round trees are cut up for lumber. We should ask the gene- fiddlers to produce square pines and oaks. Maybe they can even coax 2 x 4s to grow!

ACOUSTICAL MIRRORS ON PLANTS

In Costa Rica, the plant Macuna holtoni, a vine-like member of the pea family, is pollinated by bats. To help echolocating bats to find its flowers in the dark, it has evolved a single petal on each blos- som that is shaped like a eoncave ultra- sound mirror. A bat searching for néctar- and pollen-bearing flowers with its ultra- sonic cries can zero in on the strong echoes reflected from the plant. Both plant and bat benefit.

(Anonymous: "Bat Mirror," New Scien- tist, p. 29, November 8, 1997)

Comment. What a neat, technically sophisticated adaptation. How did this plant "know" that the bats echolocated ultrasonically and what a good reflector would look like? Don't worry about trivia like this, evolution can explain every- thing with random mutations and natural selection!

FRUIT DUPE

Hakea trifurcata is a forlorn-looking shrub growing on rocky terrain in Western Australia, where it reaches a height of 2 meters. The fruits of this plant are enjoyed by the white-tailed black cockatoo—if it can identify them! Hakea trifurcata, you see, grows fruit that looks like its leaves, and this is very frustrating to the white-tailed black cockatoo:

> This shrub according to plant ecolo- gist Byron Lamont of Curtin Univer- sity of Technology in Perth, exhibits the first known case of self-mimicry in a plant: to avoid losing valuable seeds to predators, it disguises some of its leaves as fruits. Young plants produce only the long, needle-shaped leaves. But mature five-year-old shrubs also grow broad leaves that cluster around the slightly smaller, almost identical-looking green seed- filled fruits.

When offered branches stripped of real leaves and bearing just fruits, the cockatoos quickly demolished them. Normal branches bearing both leaves and fruit were attacked at first—especially the larger leaves. But when the cockatoos found themselves duped a large pro- portion of the time, they gave up in obvious frustration.

(Anonymous; "Fruit Dupes," Discover, 15:16, August 1994)

Comment. An even more amazing case of plant mimicry occurs among Passiflora species, which craft precise copies of the eggs of a butterfly, whose larvae decimate these plants. The butterflies see the fake eggs and go look for places to lay their eggs where there is less competition. (See vol. 1, p. 169.)

ECO-DARWINISM: DIFFUSE INDIVIDUALS

Epigenetic phenomena—those phenomena beyond the palé of DNA—are seen in "diffuse individuáis" such as fungi, where it is difficult to sepárate individual units of life. To illustrate, some fungi may be 1,000 years oíd and extend for 35 acres (15 heetares) and yet pos- sess a single, still unmodified genome.

In his review of A. Rayner's new book Degrees of Freedom: Living in Dynamic Boundaries, T. Wakeford wntes:

> So, like the World Wide Web, a fun- gal network is decentralized. There is no central región capable of ex- erting control over the rest of the network. Rayner's own work suggests that the growth patterns of fungal filaments are forged as much by the environment that they encounter as by their genes. He believes that epigenetics, the process whereby opportunities in an organism's sur- roundings díctate which genes are expressed, is the norm in micro-organisms. Genetic determinism is thus turned on its head.

(Wakeford, Tom; "We Are the Fungus," New Scientist, p. 49, May 10, 1997)

Comment. Looking at the above situation from an information viewpoint, as one must these days, it seems that the environment can somehow "interpret" genes as the situation demandB. In other words, genes are not "single-message" information carriers, but can be "read" in different ways according to the environment encountered by their "carriers" that is, the organismB that bear them.

Is this how "adaptive evolution" works?

If it is, the genome must contain a multitude of "contingency plans" because the environment by itself cannot add a new suite of capabilities to the genome; it can only trigger what is already there! But maybe there is something we are missing in all this.

BEHAVIOR

THE INTELLIGENCE OF PLANTS

It is easy to dismiss plants as a lower form of life even though they compose 99% of the earth's biomass. Plants don't move much, are pretty quiet, and cer- tainly do not think—we think! It seems, though that the oíd phrase "dumb as a stump" is very far off the mark. How far off, we don't know because we are just now realizing how complex plant behavior really is.

Humans possess five major senses, but plants continuously monitor 15 differ- ent environmental variables, from sun- light to the alighting of a herbivorous insect. These signáis from the plant's sensors are fed into a remarkably diverse communication system comprising Chemicals (proteins, hormones, nucleic acids, etc.), electrical signáis, and mechanical information. Every plant pro- cesses a prodigious amount of information — how and where this is done we don't . know. We do know, though, that incomíhg information is acted upon in ways that increase the fltness of the plant. If intelligence is defined as adaptable behavior leading to increased survivability, then plants are intelligent.

Take the dodder, a parasitic plant, as an example. It reaches out for a host and upon contact assesses its exploit- ability within an hour or two with its sensors. If the first potential host is inadequate, it makes a "conscious" decisión to move on to another prey. When a suitable host is found, the dodder coils around, deploys the appropriate number of suckers, and starts to siphon off the host's resources.

Plants even warn their neighbors of herbivore attacks by releasing volatile Chemicals and thereby allowing early construction of Chemical defenses. It has also been observed that in some contacts with herbivorous inseets the attacked plant sends out specific volatile signáis that attract the proper species of parasite that will dispateh the insect attacker.

Where are these plant decisions inade and where do the 15 streams of sensor data end up? Dntold numbers of bytes must be processed somewhere but we know of no plant central-processing- unit. We suppose that plant brains are of a distributed nature and employ Chemical and electrical "chips." In reality, we can only guess because we have long ignored the information- processing as- pects of this kingdom of life. A king- dom, which, lest we forget, powers all other life exeept a few bacteria that can tap geochemieal energy sources.

(Trewavas, Anthony; "Mindless Mastery," Nature, 415:841, 2002. Schultz, Jack C.¡ "How Plants Fight Dirty," Nature, 416: 267, 2002)

A CODGHING TREE

The New Zealand Herald reported that hundreds of people are flocking off to a 3,400-year-old maidenhair tree southeast of Beijing, China, to hear the tree make a coughing sound at night. According to the Beijing Even- ing News, the tree makes the unusuai sound several times during the night and resembles an oíd man coughing.

The tree is nearly 83 feet (25 m) high and nearly 50 feet (15 m) in circumference and is regarded as a living fossil. As many as 1,000 people at a time have visited the tree to witness the phenomenon since it was first reported April 5th. Speeulation abounds as to what causes the coughing sound at night, but no reasonable explanation has yet been presented.

(Anonymous; "Coughing Tree Attracts Hundreds," World Explorer, 1:6, no. 8, 1996)

DISTRIBUTION

FOREST RINGS

No! These rings have nothing to do with crop eireles, ñor with fairy rings either.

Forest rings are best appreciated from a light plañe. Hunters and hikers in Canada's boreal forests walk right across the rings without noticing them. But from the air, they are striking apparitions.
Most are less than 300 meters in diameter, but the largest is 2 kilometers across.
Basically, they are annuli of sparse growth amid dense stands of trees both inside and outside the rings. The barren rings-------- some 2,000 have been found----appear light-colored against the dark green of the healthy forest growth.

Why don't trees grow well within the rings, and why the neat circles?

At first expanding rings of fungus in- fection were suspeeted, something perhaps like the fungus that creates those fairy r>gs on lawns. But no fungus has been found on the tree roots. One curious fact was discovered about the soil where tree growth is sparse. The soil constituting the rings is poorly drained and is de- pressed 1-2 meters below the surrounding healthy forest. These circular depressions support mainly peat and tamaracks. But what causes these ring- shaped depressions?

One theory holds that the rings are the suface expressions of diamond-beanng kimberlite pipes, like those in South Africa. A few prospectors are already staking diamond- mine claims! Another theory supposes that the rings are created by huge, natural electrical batteries that exist in the carbonate soil. The current flow supposedly creates acidic conditions that eats away at the soil causing it to slump in a circle around one terminal.

(Shilts, ELizabeth; "Stranger Than Science Fiction," Toronto National Post, March 16, 1999. Cr. G. Duplantier via L. Farish)

Comment. Maybe UFOs are to blame after all!

GREAT WALLS MAKE DIVERGENT NEIGHBORS

Apparently, the Great WaU of China, which rises as high as 7 meters in some places, did not protect China from in- vasions from barbarians to the west.
The Wall did, however, permit "signifi- cant genetic differentiation" of plants on opposite sides. Plants propagated by windblown seeds were not affected as much as those dependent upon insect pollinators.

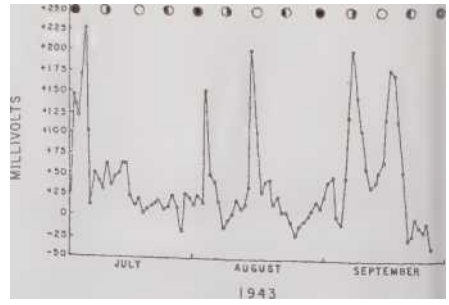
(Holden, Constance, ed.; "Sepárate Ways," Science, 300:1501, 2003.)

BODILY FUNCTIONS

ARBOREA! INTERNETS

O ver a half century ago, Y ale scientist H. S. Burr was inserting electrodes into trees to measure how voltage differences varied during the day and lunar month. Y. Miwa, at Waseda University in Tokyo, has gone more than one step farther.
He and his coworkers have placed electrodes in the trunks of trees—250 trees at a time—and measured the voltage differences every 2 seconds. They have discerned intriguing synchrony.

Miwa and his colleages studied prim- eval forests in Japan's Shizuoka and Nigata Prefectures, reqording signáis for two days at a time. In each forest, there were several groups of be- tween 20 and 50 trees showing a similar pattern of changes in their poten- tials, each of which contained about half a dozen species. Neighboring trees were the most likely to be syn- chronized, but the groups did not have rigid boundaries. The member-



H. S. Burr's measurements of the averaqe potential difference between electrodes inserted in a tree correlated with lunar phase. (From: Yale Journal of Biology and Medicine, 19:249, 1944)

ship of the groups was also not fixed: between the ñrst and second days of recording, individual trees "]'oined" and "dropped out".

Miwa advances the idea that the trees must somehow be communieating with each other to achieve this synchrony. Botanists, though, suspect that environ- mental conditions forcé this coordinated behavior. Miwa will next remove a few merabers from each group to see if his arbicides are noticed by the neighbors.

(Endo, Shinichi; "Japan's Ancient Trees Whisper Their Secrets," New Scientist, p. 19, May 13, 1995)

Croes reference. This is not the first time we have offered evidence of "tree talk". See "Trees Talk in W-Waves". (vol 1, p. 171)

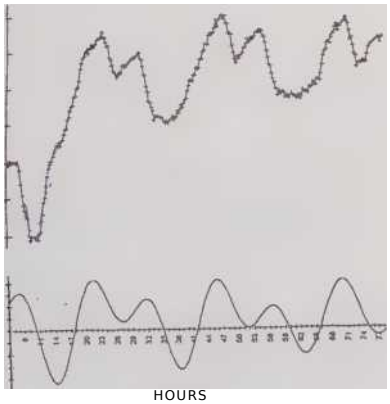
LUNACY IN TREES

More than a half-century ago, Y ale bio- logist H.S. Burr inserted electrodes into trees and found that the voltages between them varied with the phase of the moon. (Ref. 1)

The influence of the moon upon trees is even more palpable: the diameters of tree stems also bloat and shrink with the position of the moon in the sky. There is a tide in the affairs of trees, it seems. If tides occur twiee a day, so do the swellings and shrinkings of trees.

These tidal patterns are evident even when the trees are kept in darkness and at constant pressure and humidity. Even more surprising, chunks of tree stems that are sealed to prevent water from flowing in or out will still expand and contract according to the 24-hour, 49-minute lunar óyele as long as the cambium, the most active growing región, survives.

The dimensional changes are small------ only tenths of a millimeter, but even these seem too lar ge, given the weak- ness of the moon's gravitational fleld here on earth. (Reís. 2 and 3)



HOURS

(Top) Tree-stem diameter. Ordinate scale marks are 0.04 míllimeters apart. (Bottom) Tidal forcé. Ordinate scale marks are 20 milligals apart.

(Ref. 1. Burr, H.S.; "Moon Madness," Y ale Journal of Biology and Medicine, 19:249, 1944. Ref. 2. Zurcher, Ernst, and Cantiana, Maria-Giulia; "Tree Stera Diameters Fluctuate with Tide," Nature, 392:665, 1998. Ref. 3. Milius, S.i !'Tree Trunks Swell in Synchrony with Tides," Science News, 153:245, 1998)

THE SOLAR CYCLE AND SEED GERMINATION

If a group of seeds from a particular species of plant are all provided with a stable, uniform terrestrial environment, one would expect that they would all germinate in about the same length of time. Therefore, the influence of solar activity, as described below by B.G. Cumming, is most unexpected.

> There were pronounced fluctuations in the percentage germination of seeds of Chenopodium botrys that were kept stored in darkness under carefully controlled conditions of temperature, humidity, and baro- rnetric pressure. Germination tests were conducted over a period of more than 2 years in controlled environment cabinets at 30°C with different photoperiods supplied by fluorescent iight. The fluctuations in percentage germination showed no evident cor- relation with the following factors: relative humidity, barometric pressure, lunar cycle, magnetic intensity. There were highly significant correlations between the fluctuations in germination and solar radio flux (10.7 cm wavelength, indicative of sunspot activity)... .The present evidence affirms the contention that largely unexamined exogenous factors may influence rhythmic biological pro- cesses.

(Cumming, Bruce G.; "Correlations between Periodicities in Germination of Chenopodium botrys and Variations in Solar Radio Flux," Canadian Journal of Botany, 45:1105, 1967)

EMF FERTILIZER?

In 1986, the U.S. Navy bogan operating a 90-kilometer-long radio antenna stret- ching pole-to-pole through a Michigan forest. Broadcasting at only 76 hertz, this long antenna can communicate effec- tively with submerged submarines. Al- though the antenna produces electromag- netic flelds about the same as those from a lar ge household appliance, some of the trees adjacent to the antenna have enjoyed an unexpected spurt in growth, according to D. Reed and G. Mroz of the Michigan Technological Uni- versity.

> The researchers have been gathering data on the growth of trees since 1985, making measurements at two sites, one near the antenna and the other 50 kilometers away. The results seem to suggest that the electromag- netic field has a subtle influence on the forest. They found that two species of trees-, northern red oak and paper birch, do not seem to be influ- enced by the antenna at all. But red pines near the antenna grew taller than red pines at the distant site, while aspen and red maple grew thicker than their counterparts fur- ther off.

(Kiernan, Vincent; "Forest Grows Tall on Radio Waves," New Scientist, p. 5, January 14, 1995)

Trees are not the only plants af- fected. Algae in the upper Ford River, where the field is only 10% as strong as that near the antenna, increased chlorophyll production sharply after the antenna started operation. The cause of the growth spurts in trees and algae is still a mystery.

(Holden, Constance; "EMF Good for Trees?" Science, 267:451, 1995)

FACULTIES

A 40, OOO-YEAR-OLD SHRÜB!

üntil now, the oldest living organism trapped by our literary collecting net was a box-huckleberry that had reached the ripe oíd age of 13,000 years. (p. 170) It was only a matter of time, we realized, before this record would be deep-sixed.

In Australia, where much is passing strange, scientists have found a 40,000- yar-old shrub called "kings holly." Like the box-huckleberry, the kings holly clones itself and will grow forever until hit by an asteroid or it succumbs to human-generated poUution. Since, this plant has survived the Ice Ages, per- haps it can last out the inimical influence of the present hominid plague.

(Newman, Steve; "Oldest Life," San Francisco Chronicle. October 26, 1996. Cr. J. Covey)

TOMATOES SEE RED

And other colors, too! We touched on this subject over a decade ago. (vol 1, p. 171) Then we described how the use of red plástic mulch greatly improves the yields of tomato plants. More recent research reveáis that fruit quality and resistance to pests are also improved.
How can this be?

Plant leaves, it turna out, contain color sensors—light-sensitive pigments similar to those it the human retina. Obviously,. the plants do not "see," but the pigments provide environmental in- formation. Here's the mechanism: plant leaves reflect infrared light well, so when a tomato plant's pigments detect a lot of infrared, the plant "thinks" that it may be crowded out by competing vegetation. The tomato plant responds aggressively by growing more rapidly.

The red plástic mulch between the rows also reflecta a lot of infrared light, and it thereby tricks the tomato plant into accelerating its growth.

(Raloff, Janet; "When Tomatoes See Red," Science News, 152:376, 1997)

PLANT PALEONTOLOGY

A MAJOR PROBLEM FOR DARWINISM

A major problem for Neo-Darwinism is the complete lack of evidence for plant evolution in the fossil record. As. a whole, the fossil evidence of prehis- toric plants is actually very good, yet no convincing transitional forras have been discovered in the abundant plant fossil record. This fact has been re- cognized by both creationists and evo- lutionists as providing strong evidence for abrupt appearance theory. If macro- evolution were true, some evidence of plant evolution should exist in the abundant plant fossil record. Instead, what is found are many examples of modern plants, variations of modern plants, or extinct plants that require still more transitional forms.

(Bergraan, Jerry; "The Evolution of Plants: a Major Problem for Darwinism," TJ, 16: 118, 2002. TJ = Technical Journal)

Comment. As one might guess from the above abstract, TJ is a ereationist publi- cation. Bergman's long article is buttres- sed by about 100 referenees from the mainstream literature. The paleontological "plant problem" is no secret, but is often interred in the cemetery of anomalies.

MICROORGANISMS

Under this general hegding we encompass a wide range of biological entities and associated phenomena.

•Bacteria. Small but exceedingly common biological cells lacking a nucleus but undeniably living and possessing DNA.

•Viruses. Small but exceedingly common biological structures with complements of DNA but unable to reproduce without the aid of living cells. Viruses seem to be in a limbo between Ufe and nonlife.

•Cells in multicellular lifeforms (Metazoa). Such cells are alive but usually cannot live in isolation for long.

•Marine biological ensembles. Surprisingly dense marine congregations of bacteria, viruses, protists, gels, etc., exemplified by "marine snow."

Note that the single-celled, nucleated organisms called "protists" are not given a sepárate section in this volume but, rather, are dispersed under such headings as "plants" and "microorganisms."

BACTERIA

That bacteria are everywhere from boiling springs to human stomachs is widely recognized. it is not as well appreciated that bacteria are also found at very great depths in the earth and, apparently, in the deepest reaches of space, too. The following four headings reflect this ubiquity as well as some puzzles posed by the possible nonrandom evolution of bacteria.

•Nanobaeteria. Bacteria challenging the lower size limit conventionaily placed upon terrestrial Ufe forms.

•Bacteria in extreme environments. Boiling springs, oceanic thermal vents, deep well holes, etc. (See also: vol. 1, pp. 167, 177 178 185 207, 208, 216.)

•Bacteria in the stratosphere and space. (See also: vol. 1, pp. 65 81, 119, 120, 179.

•Evolution of bacteria. Directed, adaptive, preadaptive evolution. (See also: vol. 1, p. 207.)

NANOBACTERIA: LIFE ON A DIFFERENT SCALE

Who ever heard of nanobaeteria until those tiny, worm-like objeets were photo- graphed inside that putative Martian meteorite ALH 84001? It turns out that these very tiny cells (only 0.1 - 0.4 micrometers in diameter) are everywhere on earth, but it seems that virtually no one knows about them. The furor over ALH 84001 has underscored profes- sional and public ignorance of nanno- bacteria. Some scientists have asserted that bacteria could never be as small as those "objeets" seen in the greatly magni- fied photos of ALH 84001. This claim led R.L. Folk to fire off a letter to Science that began with these two sen-

tences:

> **Enough! As one of the discoverers of mineralized nanobaeteria on Earth, I must come to their defense. They are so abundant in samples 1 have studied that I believe they may make up most of the Earth's biomass.**

Folk reports that nannobacteria are found just about everywhere: hot-spring waters, decaying leaves, even blood. Nanobaeteria are key players in the earth's surface chemistry, precipitating a host of minerals and aeting symbioti- cally to precipítate organic hard parts.

(Folk, Robert; "In Defense of Nano- bacteria," Science, 274:1288, 1996)

Comments. Ignorance of nanobaeteria is not surprising. One needs a scanning electrón microscope to see them.

"Nanobaeteria" was spelled "nanno- bacteria" in the article digested. We have used the now-accepted spelling.

NANOBES

Get u^ed to this term! Of course you know about microbes. Well, nanobes are also life forms but so much smaller than microbes that they deserve the prefix "nano" (for 10^{-9}) rather than "micro" (for $1(T^{6})$.

The smallest recognized bacteria, Myeoplasma, lack ceU walls and fall in the size range 150-200 nanometers. Nanobes are much smaller: 20-150 nanometers. But are nanobes reaUy alive?

A drill core recently extracted from a stratum of sandstone 3 kilometers deep off the coast of Western Australia was found to be infected with miniscule fila- mentous structures. P. Uwins and her colleagues at the University of Queensland believe these structures ("nanobes") are alive. They appear to grow and have"cell walls. But skeptics assert that some life- less Chemical structures also grow. Others suspect contamination of the sample as it was raised to the surface and liandled.

Published photos of the nanobes look very much like the structures in the Martian meteorite ALH84001, which are claimed to be fossilized extraterrestrial bacteria, (p. 171)

(Dayton, Leigh; "Tiny Wonders," New Scientist, p. 13, March 27, 1999)

Comment. R.L. Folk claims that so-eálled "nanobacteria" (100-400 nanometers) are ubiquitous on the earth. Few biologists beüeve that Jife forms can be this small, and they opt for Ufeless mineral struc- tures instead.

Do nanobes = nanobacteria? We don't know.

BACTERIA IN EXTREME ENVIRONMENTS

THE EARTH'S BIOSPHBRE, 'TIS NO THIN VENEER

A recurring theme in Science Frontiers is the three-dimensionality of terrestrial life. Customarily, earth life is considered to be confined to a thin spherical shell of air, water, and earth. But the bits of deep-drillers have demonstrated that life prevails as far down as we can pierce the planet's integument. Now, K.G. Stetter et al:

> **... report the discovery of high con- centrations of hyperthermophiles [viz., bacteria] in the production fluids from four oil reservoirs about 3,0 metres below the bed of the North Sea and below the permafrost surface of the North Slope of Alaska. Enrichment cultures of sulphidogens grew at 85°C and 102°C, which are similar to in situ reservoir tempera- tures .**

Stetter et al favor the theory that these hyperthermophiles were injected into the reservoirs through: (1) drilling and secondary-recovery operations; and / or (2) natural penetration via faults and seeps. They paintedly distance them- selves from the idea, championed by T. Gold, that subterranean bacteria are aetually permanent ancient residents of a deep subterranean biosphere.

(Stetter, K.O., et al; "Hyperthermo- philic Archaea Are Thriving in Deep North Sea and Alaskaií Oil Reservoirs," Nature, 365:743, 1993)

On the other hand, in their comments on the above paper, J. Parkes and J. Maxwell do not shy away from the theory that these denizens of hot, deep oil reservoirs are really indigenous life forms deposited with sediments in distant geologieal ages, surviving still and even evolving and conquering the infernal regions. They say:

> **The results presentad do, however, provide firm evidence for the pre- sence of a subterranean biosphere in oil reservoirs; moreover they are con- sistent with demonstrations of the existence of other deep biospheres in aquifers and marine sediments, which together indícate that the biosphere is not just a thin veneer on the geosphere.**

(Parkes, John, and Maxwell, James; "Some Like It Hot," Nature, 365:694, 1993)

THE NETHER UNIVERSE OF LIFE

Bacteria well-adapted to high tempera- tures have been brought up from oil wells thousands of miles apart. All indi- cations are that these bacteria are indigenous to the wells; that is, not in- troduced by the drilling fluide. What is most interesting is the fact that these bacteria are all closely related despite their remoteness from each other. They not only look and behave alike, but they also share 98.2% of their 16S ribo- somal RNA sequences. M. Magot asks what an anomalist would ask.

> **For example, where are these bacteria from? How did they succeed in colonizing these habitats?... Are these microorganisms directly descended from bacteria that were trapped during the formation of the oil, or accompanied its migration through tens to hundreds of millions of years? Did they arrive in the oil field later as a consequence of aquifer activity? What is their mode of maintenanee and development in their environment?**

(Magot, Michel; "Similar Bacteria in Remote Oil Fields," Nature, 379:681, 1996)

Comment. Bacteria have also been ex- tracted from mineral-charged fluids cir- culating in drill holes over 12 kilo- meters deep and also in deep aquifers. There must be an unexplored universe of life thriving not only beneath our feet but also—quite possibly—beneath the forbidding surface of Mars.

ARCHAEA: TOUGH AND DIFFERENT

Today's textbooks recognize only two main divisions of Ufe: the prokaryotes (cells without nuclei) and eukaryotes (cells with nuclei). Humans and most of the Ufe forms we are famiUar with be- long to the latter group. (Curiously, human red blood ceUs lack nuclei!) However, a third basic type of Ufe has been found prospering in some extreme en- vironments. These are the Archaea, typi- ñed by the methane-producing microbes discovered clustered around hot deepsea vents, where temperatures may exceed 400°C. It is not their rugged constitu- tions that place these miniscule forms of life in a new category; it is their ge- nomes. They are radicaUy different from those found in prokaryotes and eukaryotes. The genome of one species of Archea coUected from a hot vent 3 kilo- meters deep in the Pacific has been sequenced. Biologists were taken aback. Methanococcus jannaschU, as it has been dubbed, possesses -1738 genes, of which 56% are entirely new to Science. Many of these genes do not look anything Uke those found in the prokaryotes and eukaryotes. In a word, they seem "aUen."

(MoreU, Virginia; "Life's Last Domain," Science, 273:1043, 1996)

How aUen? WeU, they are so toúgh that they could have arrived from Mars on a meteorito. MilUons of years of resi- dence in a meteorite edging its way toward a rendezvous with earth mean nothing to the Archaea. They have even been cultured from the interior of a salt crystal 200 milUon years oíd.

(Fanale, Fraser; "Martian Substanees," Science, 275:321, 1997)

DARE LIFE

If the heavens can support strange stars and dark matter (as outlined a trifle eynically above), it may be that our biosphere also harbors strange crea- tures and dark Ufe. We can't begin to even list the strange forms of Ufe that we already know about, so let's try to illuminate some dark Ufe. We don't mean subterranean Ufe but rather Ufe forms that are so far removed from the ken of biologists and their armory of sense- extenders that they might as well be on Mars—as some probably are.

The possibiüty of dark life was strengthened recently by the accidental discovery of an organism that is unUke any previously known Ufe form. üpon volcanicaUy heated rocks on the sea floor near Iceland, Germán scientists have discerned smaU (400-nanometer) spherical organistas Uving on the surfaces of larger microorganisms. Each of these new microbes operates with only a few hundred genes and seems to be alUed to the Archaea, that still-mysterious, recently recognized domain of Ufe. CaUed Necroarchaeum equitans, this incredibly tiny organism cóuld be either degenerate or highly advanced. No one can even guess! Whatever it is, our usual re- search techniques, such as the polymerase-chain reaction, have failed to tell us much about it.

(Boucher, Yan, and DooUttle, W. Ford; "Something New under the Sea," Nature, 417:27, 2002. Travis, J.; "Small Wonder," Science News, 161:275, 2002.)

Comment. Dark Life wiU evoke Uttle interest from the cryptozoologists, but in the big picture N. equitans (less than a micron long) may have more significance to biology than Nessie (30 meters long)!

NüCLEAR-POWERED MICROBES

Microbes, probably bacteria, Uving at a depth of 3.5 kilometers in a South African gold mine, survive on the producís of the radioactive decay of uranium They prosper on the radiation-created hydrogen gas dissolved in the water by combining it with carbón gases, yielding as producís methane and energy. This represente stiU another unexpected niche for deep-Ufe.

(Fields, Helen; "Nuclear-Powered Bugs," Science, 299:1307, 2003)

Comment. It is not widely appreciated that low levels of nuclear radiation seem to be essential to Ufe. When organisms are shielded from background radiation in the laboratory, their biological func- tions and health are adversely affected.

(Chapín, Douglas M., et al; "Revisiting Nuclear Power Plant Safety," Science, 299:201, 2003)

BACTERIA IN THE STRATOSPHERE AND SPACE

THE OUTER OCEAN OF LIFE

Conventionally, Island Earth is girded by a thin biofilm confined to dry land, the hydrosphere, the deep ocean muds, and the crevicular crust. Thls is a very limited view of cosmic life. The earth is an island all right, but the ocean of space that envelopes us is also pregnant
with life we scarcely know-----and perhaps something more profound than life-as- we-know-it.

Earth. An international group of scien- tists claims to have found clumps of extraterrestrial bacteria high above the earth's palpable atmosphere. Although these bacteria resemble terrestrial spe- cies, they have been detected some 41 kilometers above the earth's surface.
Their density distribution suggests that they are incoming rather than just out- ward leakage from the terrestrial bio- _ sphere. In fact, the estímate is that one-third of a ton of extraterrestrial life falls into the gravitational clutches of earth every day! Evidently, some stays aloft, some falls to the earth's surface.

(Anonymous; "Life on Mars Controversy," Meta Research Bulletin, 11:62, 2002. Source cited: www.space.com/searchforlife / bacteriajsp ace_010 731. html)

Venus. While scientists strain to justify and detect life on Mars, they may be looking in the wrong direction. The sur- face of Venus may simmer at 900°F, but its outer atmosphere is more benign.
That something alive may be there is suggested by dark clumps in the ultra- violet images of the Venusian atmosphere. The patches could be islands of bacteria subsisting upon the energy in the strong flux of solar ultraviolet light.

A team at the University of Texas, El Paso, theorizes:

> ...that microbes could be living in the clouds 30 miles [48 km] up in the Venusian atmosphere, where condi- tions are relatively balmy—water droplets are present, the temperature is 150 degrees Fahrenheit and the atmosphere is similar to what it is on Earth. Using data from the Russian Venera space missions and the U.S. Pioneer-Venus and Magellan probes, the team found Chemical oddities there that could be explained by the pre- sence of living microbes.

(Ackerman, Todd; "Life on Venus May Be Microbe Clouds," Houston Chronicle, October 14, 2002. Cr. T) Phelps.)

Comment. In sum, we are of course eertain that the earth is awash in the cosmic sea of life. From above, it sounds far-fetched, but the atmosphere of Venus may be a fertile place, too. The several space probes sent to Mars just may radio back that life also prospers there in subsurface wet areas. Europa might also be an abode of life, too:

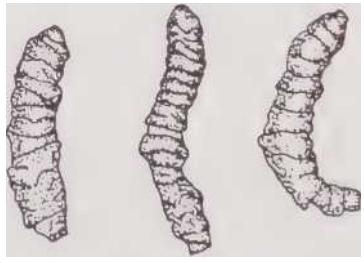
But there may be much more to all this than the mere presence of life in the solar system. The cosmos beyond Pluto is not only unknown but perhaps incomprehensible to today's weakling Science- There may be other biologies out there.

For more allied speculations, see Comments after the digest "Did ID Have Dimensional Limits?" on p. ***.

EVOLUTION OF BACTERIA

EARLY LIFE SURPRISINGLY DIVERSE

The three life-üke forms sketched below may be tiny microorganisms, not worms as they appear to be. They are thought to be bacteria, for they elosely resemble modern eyanobacteria. What is most im- portant about these fossilized raicro- organisms is that they were found in the Apex chert of Western Australia.
The Apex chert is designated Early Archean and assigned an age of 3.465 billion years [Four significant figures !]. It is rare to find any fossils at aU in rocks this oíd, but apparently the Apex chert escaped most of the fossil-destroying metamorphism afflicting most Precambrian formations. Even more remarkable is the diversity of these suspected bacteria. J.W. Schopf reporte finding no less than eleven dif- ferent kinds so far—and our planet was only a few hundred million years oíd at the time the Apex chert was formed.



Putative fossils of very ancient forms of life. They elosely resemble modern eyanobacteria.

Schopf's discoveries generate at least three questíons:

(1) How could life have originated and diversified to such an extent in just a few hundred millions years?

(2) Why after such rapid diversifica- tíon did these microorganisms remain essentiaHy unehanged for the next 3.465 billion years? Such stasis, common in biology, is puzzling.

(3) If these microorganisms are really eyanobacteria, they would have released oxygen to the atmosphere. Is the standard assumption that the earth's atmosphere lacked oxygen until 2.2 biHion years ago correct?

(Schopf, J. William; "Microfossils of the Early Archean Apex Chert: New Evi- dence of the Antiquity of Life," Science, 260:640, 1993. Also: Pendrick, D.; "Fossils Show Early Diversity of Life," Science News, 143:276, 1993)

Comment. It is, in fact, quite possible that life-like forms, such as those shown above, may have been created abioticaUy by natural geochemical processes. In 2004, chemists produced very similar objeets in the laboratory.

PREADAPTIVE EVOLUTION

"Preadaptive evolution" is a remarkable concept. Basically, it asserts that in some—possibly many-----mutations, a use- ful response to an evolutionary challenge is "naturally" accompanied by useful re- sponses to challenges that have not yet been posed to the life form in question. This prescience verges on the miraculous to the uninitiated, but mainstream bio- logists seem content to write the phe-
nomenon off as merely good fortune------likc hitting two jackpots in a row on the same slot machine.

A good example of preadaptation oc- curs when bacteria are cultured in the presence of an antibiotíe. Within a few weeks, they have evolved a resistance to that particular antibiotíe. This weU-known phenomenon is easily explained by evolution. However, often the newly evolved (or "adapted")- bacteria are also resistant to several other antibiotíe s that work by different mechanisms. AJ1 of the múltiple gene changes needed for the several different defense mechanisms are eontrol- led by a single site on the same chromo- some.

(Levy, Stuart B.; The Antibiotíe Paradox, New York, 1992, p. 99. Cr. A. Mebane)

Comments. How can bacteria prepare de- fenses against antibiotics they have not been exposed to? Luck, prescience, or some unrecognized mechanism?

In his Ever Since Darwin, S.J. Gould acknowledges that "preadaptation implies prescience although in actuaUty it means just the opposite! His explanation of "pre- adaptation is not easy to grasp.

> In short, the principie of preadaptation simply asserts that a structure can change its function radicaily with- out altering its form as much. We can bridge the limbo of intermediate stages by arguing for a retention of oíd func- tions while new ones are developing.

"ADAPTIVE" MUTATION

Six years ago, J. Cairas performed ex- perimenta with bacteria that implied that said bacteria could "direct" their own mutations so that they could cope more speedüy with sudden environmental trauma, (vol. 1, p. 180)

In Cairas' experiments, bacteria un- able to digest laclóse were presented with an aU-lactose diet. They quickly acquired the mutations needed to digest the only food available. They did not have to wait for random mutations to accidentally hit upon the correct genome changes.

A firestorm spread across the scien- tific community, even though other re- searchers saw similar effeets. It was traumatic! One of science's foundation stones was at risk. The current theory

of biological evolution insists that all mutations are random. Cairns believed he had shown that his bacteria experi- enced only useful mutations. This claim was too awful to aceept.

In the July 21, 1994, issue of Science, two new papers appeared that, while not proving that only useful mutations occur in Cairns-type experiments, do indicate that something unusual is indeed happening. Basically, when bacteria are under stress (say, starving), a "distinctive" type of mutation occurs!
Is "distinctive" a code word for "non-random"? The title of the commentary accompanying the two articles says it all.

(Culotta, Elizabeth; "A Boost for 'Adap- tive' Mutation," Science, 265:318, 1994)

COMMUNICATION AMONG BACTERIA

Scientists have long considered bacteria to be self-contained, self-sufficient, independent organisms. The collective action of such simple, unicellular organisms has always seemed extremely un- likely.

But simple though they are (cells without nuclei), bacteria are now known to communicate cell-to-cell to control gene expression and action. This unex- pected type of communication is termed "quorum sensing."

Such inter-bacterium signalling can lead to collective action; such as the cooperative construction of biofilms. In biofilms the bacteria assume different metabolic functions in the rather com- plex biofílm structures that are not un- like those transpiring in simple multicellular life forms.

E.P. Greenberg expressed his amaze-ment at this remarkable bacterial commu-mcation and collective action with:

How could this have evolved?

(Greenberg, E. Peter; "Tiny Teamwork," Nature, 424:134, 2003.)

VIRUSES

DO VIRUSES CONTROL THE OCEANS?

You may avoid the beaches after you learn that one teaspoon of seawater typically contains 10-100 million viruses and one-tenth that many bacteria. Obviously, most are harmless to humans. However, the viruses do infecí the bacteria and phytoplankton, destroying them, and thereby releasing their nutriente. By doing this, they keep the oceans' biological engineB running. Fur- ther, the viruses act as genetic engi- neers as they transfer DNA from one individual to another. The oceans may be viewed as vast test tubes in which bio- diversity is maintained by teeming, invasive viruses.

(Suttle, Curtís A.; "Do Viruses Control the Oceans?" Natural History, 108:48, February 1999)

CELL

This section is devoted to the anomalous behavior observed ín isolated cells as well as those comprising multicellular organisms. Not only do some of these cells possess some autonomy of movement, but as acquire malignant tendencies during the onset of cáncer, they may adopt seemingly purposeful behavior inimical to their superorganism.

Of particular interest to anomalists are: (1) the complexity of the structures within cells; (2) the intracellular communication and trans- portation paths; and (3) the different methods evolved for the conversión of Chemical to mechanical energy.

UNEXPECTED SIGNALS WITHIN LIFE FORMS

Multicellular organisms are information networks. They have to be because life is conferred by the flow of information. We all learn how the nervous system carries á heavy traffic of electrical signáis, but we hear less about Chemical signáis, and they are more important. Chemical signalling molecules help cells learn what is going on around them so that they can make decisions concerning metabolism, división, and even whether to die not not. This is mainstream bio- chemistry, although there is much here yet to be learned. A signalling médium that still survives well off the main-stream is the oíd idea that information is carried from cell to cell via electro- magnetic radiation.

Yes, we mean mitogenetic radiation—the infamous M-rays of the 1920s and 1930s. During this period about a thou- sand teehnieal papers were published on mitogenetic radiation—mostly in Russian. The Champion of mitogenetic radiation was A.G. Gurwitsch. He claimed that fundamental biological functions, such as cell división, were communicated via ultraviolet light. Although a few other researchers said they detected mitogenetic radiation, most could not replícate Gurwitsch's work. Mitogenetic radiation was thereafter subjected to the "cold-fusion" treatment; it was one of those things that "wasn't so"!

In a recent article in the Journal of Scientiñc Exploration, R. Van Wijk tries to reignite interest in "bio-photons" that carry "bio-information." First, he as- sures us that mitogenetic radiation is real, that bio-photons truly exist. To thus swim against the scientific mainstream, he reviews recent experiments and provides us with a huge biblio- graphy. Apparently, mitogenetic radia- tion is not "pathological Science," as physicist I. Langmuir called it back in 1953. Second, Van Wijk advances some mechanisms by which cells can generate bio-photons via their metabolic and enzymatic processes. Finally, he comes to the crux of the matter: Do bio- photons reaHy transmit information to neighboring cells and thereby affeet their functions? Bolstering his claims, Van Wijk cites confirming modern experiments with seeds, neotrophil cells,
, dinoñagellates, and firefUes. (Fireflies employ bio-photons internally in addition to their external flashes.)

(Van Wijk, R.; "Bio-Photons and Bio-Communication," Journal of Scientific Exploration, 15:183, 2001)

Comments. Most of Van Wijk's references are European.. He was apparently un- aware of V.B. Shirley's positive review of the subject in a 1990 issue of Physics Today. (See vol. 1, p. 175 for our digest.) For a mainstream review of the complexities of intercell Chemical signalling, see: Downward, Julián; "The Ins and Outs of Signalling," Nature, 411:759, 2001.

THE INTRACELLULAR RAILWAY

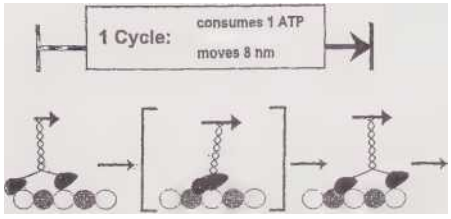
The usual concept of a cell is that of a bag-like membrane containing a mixture of organelles and other cell components sloshing around in the fluid-like cyto- plasm. This picture does not convey the reality and complexity of the highly organized movements of tens of thousands of proteins obeying the instructions of the cell's Chemical communication system.

Not much would get done in a cell if its constituents had to contact each other randomly. To organize and accel- erate cell business, a complex system of filament-like microtubules pervades the cell. These microtubules are the tracks of the intracellular railway. We don't know how this transportation system was built, so we will focus on the little engines that carry cargos from one place to another along the microtubules.

These engines are true machines. They are called "motor proteins." At any moment, untold billions of them are carrying biological freight throughout your body.

The motor proteins belong to three broad families. Each family boasts many engine models because many different tasks must be performed. The kinesin motor proteins number óver 250 and transport a variety of cargos, including chromosomes, around the cell's 3-D railway system.

The kinesin motor molecules consist of two identical proteins. Each has a sepárate head (called a "motor domain") and a cargo-binding domain. A stalk joins each domain and, in addition, coils around its partner protein. The two heads of the combined proteins attach to the microtubule railway, with their stalks looking a bit like legs, and their "heads" acting like "feet." The cargo is carried "above" on two cargo domains. The motor protein "walks" or "inchworms" its way along the microtubule to its assigned destination. Each "step" burns one molecule of ATP (adenosine tri- phosphate).



One "step" of a motor protein using the inchworm mode of progression. The heads of the two entwined proteins in effect walk along a microtubule. Their cargo is carried at the top where the arrow is located. (nm = nanometer)

(Gilbert, Susan P.; "High-Performance Fungal Motors," Nature, 414:597, 2001. Couzin, Jennifer; "Molecular Motors Move in Mysterious Ways," Science, 295:780, 2002. Hua, Wei, et al; "Distinguishing Inchworm and Hand-over-Hand Processive Kinesin Movement by Neck Rotation Measurements," Science, 295:844, 2002)

Comments. With thousands of motor proteins eontinuously walking or inchworm- ing along the cell's 3-D railway, carrying thousands of different proteins and cell components, we have to believe that some- where a control center is sending out multitudinous Chemical messages to en- sure that the right cargos get to the right places at the right times.

Furthermore, each motor protein must be able to receive instructions, find and pick up the right cargo, and drop it off at an assigned destination. All this requires all the sensors, motors, and Controls of a sophisticated machine. Yet, proteins are only long, "apparently" mindless strings of amino acids that fold up into hundreds of thousands of different forms.

Is the intracellular railway irreducibly eomplex? One does wonder!

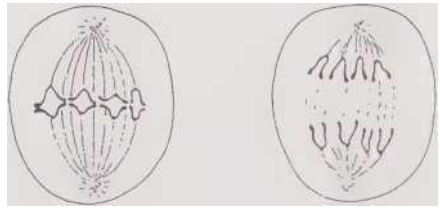
CHROMOSOME CHOREOGRAPHY

Every biology student has seen sketches of the "dance of the chromosomes" that is performed when eukaryote (nucleus-containing) cells divide. Because chromo- somes are composed of genes and their DNA----the Information carriers of in- heritance—it reasonable to suppose that they are the "dance-masters." This expectation is enhanced if one holds that the genes are "selfish;" that is, they have their own evolutionary agendas, and all life forms exist only to execute their "will."

But cell división would not occur at all without the action of the cell's bipolar spindle. This spindle is composed of microtubules---rods of the protein "tubulin." Somehow, when cells are about to divide, they synthesize these microtubules, which then seem to or- ganize themselves into orderly arrays (the bipolar spindles). Then, the micro- tubúles sort out and sepárate the two sets of chromosomes required for the two new cells. So, far, our description conforms to what biologists have known and accepted for decades; but there is something more mysterious going on.

In 1996, researchers discovered that they can actually substitute DNA-covered beads for the chromosomes, and the microtubules will still go through the motions of sorting and separating the chromosome-less strands. Actually, the microtubules will perform their act even without the DNA-covered beads.
In a sense, the bipolar spindle is a puppetmaster, and the microtubules are the strings. The puppet show can go on without the puppets (chromosomes).

(Hyams, Jeremy; "Look Ma, No Chromo- somes," Nature, 382:397, 1996. Also: Heald, Rebecca, et al; "Self-Organiza- tion of Microtubules into Bipolar Spindles around Artificial Chromosomes...," Nature, 382:420, 1996. Travis, John; "Mitotic Mischief," Science News, 150:14, 1996)



Microtubules separating chromosomes prior to cell división. (Left) Early anaphase. (Right) Late anaphase. Rote that Chemical energy is being converted into mechanical energy here.

Comments. ,Obviously, neither the chromosomes, the genes, ñor the DNA are the master of the show. They are merely passive players in cell división.
It is fair, therefore, to ask how these microtubules originate and opérate. Whence the information and instructions ("program") required to put on the show? "Self-organization" is the current answer of mainstream biologists, but this term has no explanatory valué.

UNIDENTIFIED CELLDLAR OBJECT

The multitudinous cells that make up our bodies are miniscule factories humming with activity. The microscope reveáis mitochondria, chromosomes, centrioles, granules, and a host of entities doing their own things. But even after genera- tions have serutinized our cells, new objects are discovered. The latest, only recognized in 1986, look like a miniature hand grenades. Called "vaults" these objects are composed of proteins and ribosomal DNA. They exist only in the cells of the higher organistas—like us. Biologists surtnise that they are im- portant in some way but have no idea what they do.

(Anonymous; "Cell Biology Mystery," Science, 289:355, 2000)

FOÜR-DIMENSIONAL BIOLOGY

Going 3-D. Laboratory biology has for decades relied upon 2-D Petrie dishes and their kin. Not surprisingly, cells behave differently when confined to a fíat world. Things are therefore chan- ging in the labs.

To grow a 3-D culture, cells need to be embedded in a structure that mimics the extracellular matrix of structural proteins and other biologi- cal molecules found in real, living tissues.

In these more realistic milieus, one finds cells doing unexpected things. Cáncer cells, for example, escape from their locations and, amoeba-like, crawl away. This type of cáncer mobility differs from metástasis, possibly making cáncer more dangerous and "insidious."

(Abbott, Alison; "Biology's New Dimensión," Nature, 424:870, 2003.)

MARINE BIOLOGICA!.

MARINE SNOW

The marine analog of the high-altitude D2 used to collect interplanetary dust is the scuba diver armed with small jars and syringes. In these, marine biologists, such as A. Alldredge, collect the tiny bits of debris drifting down- wards from the ocean's upper layers.
This is the "marine snow." Its eonstitu- ents are mainly:

...the tiny leftovers of anímala, plants, and non-living matter in the ocean's sun-suffused upper zones. Among these partióles are chains of single-celled plants called diatoms, shreds of zooplankters' mucous food traps, soot, fecal pelleta, dust motes, radioactive fallout, sand grains, pol- len, and pollutants. Microorganisms also live inside and on top of these odd-shaped flakes.

Marine snow is everywhere in the ocean. Sometimes, it reaches blizzard proportions, and divers cannot see be- yond a few feet. Measured in millimeters, the marine snow flakes are much larger than the average interplanetary dust partióles (but of course interplanetary dust itself is also a constituent of marine snow). The bigger marine snow-flakes over 0.5 mm--------are a major food source for deep-sea denizens waiting below for this manna from the watery heaven.

The reason for mentioning marine snow in Science Frontiers is that biologists like Alldredge are really pió- neering new territory, where new anoma- lies must surely dwell.

'We've essentially discovered a whole new class of partióles in the ocean that no one knew was there,' she exulte.

'They're islands, really, where the metabolic aetivities of algae, bacteria, and protozoans produce unique Chemical environments,' says All- dredge.

To illustrate, the carbón contení of bacteria on marine snow is 10,000 times higher than that of bacteria found away from the snow, Why?

(Cox, Vic; "It's No Snow Job," Sea Frontiers, 40:42, March/April 1994)

I MUST GO DOWN TO THE GOO AGAIN!

With apologies to Masefield for mangling a line of his poetry, it really is time to go down to the sea and examine its micro- structure. The ocean is not what it seems.

When you snorkel in crystál-clear Caribbean waters, you do not sense that you are swimming in a very thin jelly. In reality, ocean water is filled with a complex tangle of microscopio strands and partióles of gel. According to F. Azam, an oceanographer at Scripps:

> It's not in the textbooks or in the classical explanations. The gel's ex- istence fundamentally changes our ideas of the microcosmos in which sea organistas live. It has added another layer of complexity that people are only now starting to consider in the context of whole ocean systems,.. Gel is like the dark matter of the sea.

While sea gel does not impede the snorkeler, it does herd microbes into clumps or microniches, which we cannot see either. These microbes, in effect, exist in a tangled, 3-D mesh that affects not only their movements but also those of their prey and predators.

A few statistics confirm the amazing complexity of the seawater microcosm and its incredibly high microbe population density.

The long strands in the oceanic gel are mostly crosslinked polysaccharides. If the polysaccharides in 1 milliliter of seawater could be placed end-to-end, they would stretch out to 5,600 kilo- meters! Coexisting proteins would span 310 kilometers; DNA, 2 kilometers. This same milliliter may also contain up to a million bacteria and ten times as many virus partióles. Also in this brew are, on the average, 1,000 protozoans and 100 phytoplankton. It's a microscopic metrópolis, about the size of a sugar cube, and one in which you may never wish to swim again!

The polysaccharides and proteins that comprise most of the thin goo are not alive, although the bacteria are. Just how this thin goo and its multitudinous inhabitants evolved has not been ex- plamed. Which carne first, the goo or the bacteria? Being devoid of life's spark, the goo cannot evolve, or can it?

(LaFee, Scott; "Meet Me at the Goo," New Scientist, p. 44, November 25, 2000)

Comment. Do similar rrierocosms thrive in freshwater lakes, in aquifer pores, the atmosphere? Don't shrug, even the atmosphere has its microstructure and is laden with bacteria, spores, viruses, etc.

THICKENING THE OCEAN'S BIOMASS

This receipe comes in at least four parís. The resulting broth may give you pause when you next visit an ocean beach.

Parí 1. Ocean water contabas shockingly high populations of viruses and bacteria. A teasponful typically ineludes 10-100 million viruses and one tenth as many bacteria, (p. 157)

Part 2. Ocean water is laced with long strands of gel made up mostly of cross linked polysaccharides. If the polysaccharides in 1 milliliter were placed end-to-end they would stretch out to 5,0 kilometers! Coexisting proteins would cover 310 kilometers.

Part 3. Each drop of seawater near the surface supports 20,000 cells of the microbe Prochlorococcus. This is the smallest photosynthesizing organista and one of the most abundant species of life on earth.

(Nadia, Steve; "The Cells That Rule the Seas," S cien tifie American, 289:52, December 2003)

Part 4. For sheer bulk we have the jellyfish. Studies from submersibles sug- gest that 50% of the midwater biomass consiste of jellies. (See GOO, col. 1)

(Dennis, Carina; "Cióse Encounters of the Jelly Kind," Nature, 426:12, 2003)

SUPERORGANISMS

LIFE ON DIFFERENT SCALES: SUPERORGANISMS

On p. 154., we introduced the possibility ' of the existence of nanobacteria: life forms that are smaller thah 0.4 micron, perhaps even as smaÚ. as 0.01 micron. Nanobacteria are not yet completely accepted as bona fide organisms. How- ever, electrón microscopes are imaging life-like "somethings" that are very tiny and ubiquitous.

We now shift speculation to life forms much larger than blue whales or even that 2,000-meter-wide box huckleberry mentioned in vol.I, p. 170. In fact, we will transcend even Gaia; that is,

■ earth-as-an-organism (vol. 1., p. 339); and ask whether entire universes might be alive in the sense that they are governed by natural selection, can transmit hereditary information, and thereby adapt themselves to new situa- tions.

The evidence for such large-scale living systems or super-superorganisms is widely pooh-poohed by biologists be- cause it does not meet their definition of life; i.e., metabolism, reproduction, etc. But perhaps they are missing some- thing by thinking too small. In this vein, M.G. Bjomerud has opined:

> ...there is no reason to expect that super-organisms would meet criteria based on observations of individual organisms. Isn't it time to consider the possibility that the boundary be- tween life and non-life may be diffuse, non-stationary over time, and depen- dent on scale?

(Bjomerud, M.G.; "Live Universes," Nature, 385:109, 1997)

Comments. The concept of oscillating universes that muíate to better adapt themselves---a sort of cosmic Darwinism ----can be found in vol. 1, p. 106. .

F. Hoyle's science fiction tale The Black Cloud speculated about humanity's encounter with an immense, sentient, intelligent molecular cloud!

GAIA AS A SUPER-SUPERORGANISM

The Gaia hypothesis States that the earth's environment is maintained suit- able for life by life itself. Our climate, atmospheric oxygen level, ocean compo- sition, and similar vital conditions are kept livable by life's waste producís, such as the oxygen emissions of plañís. That something like Gaia is required is seen in the extreme disequilibrium of the earth's atmosphere compared to the near-equilibrium of the atmospheres of apparently lifeless Venus and Mars. For example, our atmosphere's 21% oxygen, a highly reactive gas, is many orders of magnitude higher than one would expect on a lifeless planet. Furthermore, life-friendly conditions have been main- tained for billions of years despite lar ge changes in the sun's output and the traumas of asteroid impaets.

T.M. Lenton, writing in Nature, asks a salient question: How has planetary self-regulation (Gaia) been established and maintained by evolution and natural selection which opérate on the level of individuáis? In other words, evolution tells us that organisms should evolve so as to leave the most progeny not so as to regúlate the atmosphere. Lenton an- swers that there must be feedback loops from the planetary environment that steer the evolution of individuáis in the "proper" direction. Lenton goes on to explore some of these many feedback mechanisms; one obscure loop involves the production of dimethyl sulfide by marine phytoplankton. Truly, it is a tangled bank! All of the feedback loops imply that the evolution of life forms is constrained (or dictated) by the need to keep the planet livable and not to simply leave the most progeny, but rather the progeny that will best serve Gaia!

(Lenton, Timothy M.; "Gaia and Natural Selection," Nature, 394:439, 1998)

Comments. The obvious implication is that all life forms, including humans, are parta of a planet-sized super-super- organism. This leads to the oft-stated and possibly true suspicion that, if a species endangers Gala by creating ozone holes and undue global warming, the ^ super-superorganism will take appropri- ote steps-—new diseases, for example.

SUPERORGANISMS: FROM SIMPLICITY TO COMPLEXITY

Superorganisms are biological entities made up of large numbers of simpler entities that have banded together to perform functions they cannot do as individuáis. Termite mounds are often mentioned as superoganisms. But here we examine colonies of organisms that are much simpler and mueh smaller than termites.

What entices the anomalist to attend to superorganisms? Here are two of the several questions superorganisms raise. __

- •How do superorganisms evolve properties that their eonstituent individuáis do not possess, such as mobility, unique sensors, and ' even a modicum of intelligence.

- eSince superorganisms do not reproduce as superorganisms, how can natural selection opérate on these superorganisms?

Salps. Books dealing with the unex- plained sometimes inelude a photograph of a huge marine creature identified as a sea monster. This famous photo is real and so is the monster in it. But this creature is not reptilian; it is really a salp, a colonial tunicate. Tunicates are tiny, primitive marine organisms usually classified as invertebrates. Some species of tunicates have somehow acquired the habit of aggregating in immense numbers to create long, hollow, snake-like tubes called "salps." Salps may reach lengths of 45 feet, with diameters of 3 feet. No wonder they are falsely identiñed as sea monsters.

Structurally, the tunicates com- prising the salp are embedded in a gelatinous wall facing inward. Each possesses a siphon that pumps nutrient- carrying sea water. Working in unisón, the tunicates create a surprisingly strong current of sea water through the tube, and the salp becomes jet- propelled.

Thus, we have a mobile monster, but no ship-swallowing leviathan.

(Note that we also discuss salps in the Section on Invertebrates.)

(Grifñn, D.J.G., and Yaldwyn, J.C.; "Giant Colonies of Pelagic Tunicates..," Nature, 226:464, 1970)

Slime molds. Moving down life's ladder to even smaller and simpler organisms, some amoebas have a bizarre life cycle that ends as a superorganism called a "slime mold." If you viewed an amoeba through the microscope in biology lab, you know that they are very tiny, very simple, and most certainly not very bright. But given enough food, some species of amoeba divide and keep dividing until they clump together in a "slug" that sends out streamers and sort of flows along the surface. We now have a mobile superorganism searching for food (mostly bacteria). Eventually, the moving colony of amoebas anchors itself. Some of the superorganism's cells specialize to create a stalk called a "fruiting body." The amoebas in the fruiting body change into spores and are wafted away on the wind. In this way, the simple, lowly amoebas are transformed into a radically different entity. One wonders how this superorganism, this slime mold, is con- trolled. Where are its sensors and its information Processing, center, if it possesses one?

(Slime molds are now placed in the Kingdom Protista by some, but we will retain them as invertebrates!

(Stewart, Ian; "Spiral Slime," Scientiflc American, 283:116, November 2000)

This question becomes more difñcult to answer when we learn that slime molds can display rudimentary intelligence in the sense that they can solve mazes in their search for food. They are not as clever as rats, but they do optimize their travels through the maze.

(Nakagaki, Toshiyuki, et al; '.'Maze- Solving by an Amoeboid Organism," Nature, 407:470, 2000.)

Biofllms. Down near the bottom of life's ladder dwell the bacteria. Their genomes must be miniscule. and gray matter is not to be found. Nevertheless, some bacteria band together to form biofllms. Biofllms are three-dimensional, complex structures composed of innumerable, specialized bacteria all working together. W. Costerton at Montana State University imagines what a biofllm would look like if one were bacterium-size.

> If you found yourself in a biofllm, you'd be going along a channel full of water, like the canals in Venice, and up from the bottom of the channel, on either side, would be these slime towers. The channels would be bringing in oxygen and nutriente, and removing waste. And within each building, so to speak, some of the bacteria would be cooperating with each other, making one compound and passing it along to the next. It's at least as complicated as a tissue, and possibly as a city.

(See p. 154 for many other entries on bacteria.)

(Chicurel, Marina; "Slimebusters," Nature, 408:284, 2000.)

Comment. Since bacteria have no brains, where do the building plans of this "city" reside?

Nanocrystal aggregates. Even lifeless nanocrystals spontaneously form long, oriented chains. Self-organization is common in inorganic nature. Nanocrystals are clumps of atoms numbering in the hundreds, often thousands. Typi- cally, nanocrystals are only 1-10 nano- meters long. Even so, they have a colonial spirit, and, like the tunicates and amoebas, they aggregate and self- organize.

(See the Section on Physics and Chemistry for more on the self-organiza- tion of non-living matter.)

((Alivisatos, A.P.; "Naturally Aligned Nanocrystals," Science, 289:736, 2000.)

Comments. Sometimes that vaunted chasm separating life from non-life seems pretty narrow!

Colonies of ants, termites, and other eusocial organisms can also be classified as superorganisms. See vol. 1, pp. 159, 165.

GENETICS

THOSE SELFISH GENES MAY ALSO BE INTELLIGENT!

R. Dawkins has proposed that we humans and other organisms are merely lumber- ing life-support systems for our genes. In this view, genomes are the másters, controlling our evolution and behavior to ensure their own survival and multi- plication. In short, our genes are "selfish."

J. Shapiro, at the University of Chicago, has gone a step further and ascribed still another human attribute to genomes.

> Genomes function as true intelligent systems, which can be readjusted when conditions require. We still lack testable theories to explain how this can be done. (Genética, 84:4, 1991)

Perhaps we see evidence of this "intelligence" of genes when bacteria and other microorganisms rapidly ac- commodate to environmental challenges, as in the application of new antibiotics. In this context, read below about the fast-evolving cichlid fishes of Lake Victoria. These fish must have macho genes! (p. 191)

THE WORLD BEFORE OÜR WORLD

Genetically speaking, modern terrestrial life is bilingual in the sense that it em- ploys two Chemical languages. Function is written in the 20 amino-acid "alpha- bet" of proteins, while information is conveyed in sequences of four nucleo- tide "letters" called codons. We need go no further with the genetics les son be- cause our purpose here is to speculate a bit about the monolingual world that is believed to have preceded ours.

This older world is commonly termed the "RNA World." It was and is mono- lingual because both function and information are carried on a single molecule. It is customary to cali the RNA World

"prebiotic," meaning that it was all chemistry and no life. But, one does wonder whether that was all there was to it. Catalysis and replication of gene- tic information occurred in the RNA World. What besides a Chemical soup might have existed before "life-as-we-know-it" arrived upon the scene? A Science fiction writer like H.P. Lovecraft could certainly come up with an ominous entity based upon RNA alone.

Be that as it may, a book is now on the market bearing the title The RNA World

(R.F. Gesteland and J.F. Atkins, The RNA World, eds., Coid Spring Harbor Laboratory Press, 1993)

N ature reviewed the book in its January 20, 1994, issue. In addition.The RNA World was also discus sed recently in Science. We now extract one nugget from each of these two sources.

From Nature's review. Humans tire more primitive than microorganisms in the sense that we still retain cumbersome introns (nonsense DNA) in our genes, while lowly microorganisms have been able to elimínate them.

From Science. No one seems to have a clue about where RNA carne from. C. de Duve ventured that:

> .. .the emergence of RNA depended on robust Chemical reactions----it is wrong to imagine that some fantastic single accidental event supported the development of the RNA World.

In connection with the generally accepted idea that the evolution of RNA must have taken hundreds of millions of years:

> ...de Duve suggested that, on the contrary, for such a complex Chemical procese to succeed it must have been relatively fast in order to avoid decay and loss of information.

(Brenner, Sydney; "The Ancient Mole- cule," Nature, 367:228, 1994. O'Neill, Luke, et al; "What Are We? Where Did We Come From? Where Are We Going? Science, 263:181, 1994)

Comment. O.K. There's the RNA World, then carne ours. Will another kind of "world" succeed ours? Has it already?

THE ÜNREAD BIOTIC MESSAGE

We have been selling ReMine's book The Biotic Message in which he asserts that life itself is a message of transcendental nature. Every bacterium and human is a cosmic statement. Shifting from the macroscopic to the microscopio (pheno- type to genotype), we recall that all macroscopic "statements" are really ex-
pressions of DNA-----the genetic code. But when we examine DNA, we find that only about 3% of the DNA in human cells codes for protein manufacture. The re- maining 97% is termed "nonsense" or "junk" DNA. But there may actually be sense in nonsense DNA.

Statistical analysis of nonsense-DNA "words" (3-8 bases long) reveáis considerable redundancy. Long stretches of nonsense DNA are definitely not ran- dom. In fact, the structure of nonsense DNA resembles that of language. The coding or "sense" DNA, on the other hand, lacks this language structure. The implication is that coding and nonsense DNAs carry different kinds of messages. The former consists simply of blueprints; the latter is couched in a language that we have not yet learned to read.

(Flan, Faye; "Hints of a Language in Junk DNA," Science, 266:1320, 1994)

Comment. On the microscopio level, we can read only 3% of the biotic message!

OUR GENES AREN'T US!

Almost without exception, biology text-books, scientific papers, popular arti- cles, and TV documentarles convey the impression that an organism's genes completely specify the living animal or plant. In most people's minds, the strands of DNA are analogous to Computer codes that control the manufacture and disposition of proteins. Perhaps our current fascination with computers has fostered this narrow view of hered- ity.

Do our genes really contain aU the information necessary for constructing human bodies? In the April, 1994, issue of Discover, J. Cohén and I. Stewart endeavor to set us straight.

The arguments against the "genes- are-everything" paradigm are long and complex, but Cohén and Stewart also provide some simple, possibly simplistic observations supporting a much broader view of genetics.

(1) Mammalian DNA contains fewer bases than amphibian DNA, even though mammals are considered more complex and "advanced." The implication is that "DNA-as-a-message" must be a flawed metaphor.

(2) Wings have been invented at least four times by divergent classes (pterosaurs, insects, birds, bats); and it is very unlikely that there is a com- mon DNA sequence that speciñes how to manufacture a wing.

(3) The connections between the nerve cells comprising the human brain represent much more information than can possibly be encoded in human DNA.

(4) A Caterpillar has the same DNA as the butterfly it eventually becomes. Ergo, something more than DNA must be involved. [This observation does seem simplistic, because DNA could, in principie, code for metamorphosis.]

like DNA, this "Bomething more" passing from parent to offspring conveys information on the biochemical level. This aspect of heredity has been by- passed a8 geneticists have focussed on the genes.

Cohén and Stewart summarize their views as follows:

> What we have been saying is that DNA space is not a map of creature space. There is no unique correspon- dence between the two spaces, no way to assign to each sequence in DNA space a unique animal that it "codes for." Biologieal development is a complicated transaction between the DNA "program" and its host or-
> ganism, neither alone can construct a creature and neither alone holds all the Becrets, not even implicitly.

(Cohén, Jack, and Stewart, Ian; "Our Genes Aren't Us," Discover, 15:78, April 1994.)

GENE WARS

In past issues, we have mentioned:

Sperm wars. Where an animal's sperm are polymorphic; some of which attack alien sperm, some dash directly to the eggs, etc. (vol. 1, p. 175)

Selfish DNA. Where animáis are mere- ly mechanisms by which DNA perpetuates itself and expands its domain. In other words, DNA calis the shots—not us! (vol. 1, p 183)

Now we learn about "gene wars." As is well known, genes are thought to control much of what goes on in a living organism. But are they only carriers of hereditary information? Not according to a long, very technical paper by L.D. Hurst et al. It seems that, like selfish DNA, genes have their own agendas.
The insidiousness of this is seen in the first sentence of the paper's abstract:

> Self-promoting elemente (also called ultraseífish'genes, selfish genes, or selfish genetic elements) are vertically transmitted genetic entities that manipúlate their "host" [as in "us'] so as to promote their own spread, usually at a cost to other genes within the genome.

You may not sense it, but your genes are struggling with each other, and you and/or your progeny will carry out the dictates of the victors of the "gene wars."

(Hurst, Laurence D., et al; "Genetic Conflicts," Quarterly Review of Biology, 71:317, 1996)

Comment. Given the power that these "selfish genetic elements" can exert on our bodies, it is but a short step to imagining that they can also direct the course of evolution in ways favorable to their agendas.

In this interpretation, humans have evolved and are conscious and intelligent because these things are favorable to those genes that have conquered in the "gene wars." Natural selection seems to work at many levels in biology!

THERE'S MORE TO HEREDITY THAN DNA

The popular conception is that all in- herited characteristics are encoded in an organism's DNA—that genes are everything. However, more and more phenomena are now being attributed to "epigenetic" factors, which are: "modi- fications that do not change the sequence of DNA, but affect the way it works." These modifications, even though not carried by the genetic code, can still be inherited!

This sort of language verges on heresy. It is certainly not what we hear

asserted in the popular Science media.

In the laboratory, popular conceptions are being challenged. For example, W. Reik and colleagues at the Babraham Institute (England) have found that a nouse embryo's environment can produce lasting, inheritable changes in the way DNA works.

> "It took us a long time to believe it," admits Reik, who does not yet know how environraental influences produce heritable changes in gene function.

Seconding Reik, L. Hurst, a pro- fessor of genetics at the University of Bath, ventured:

> This extremely important finding shows that genes are not enough. We will need to do more than sequence genes to understand how the genome Works.

What other sorts of observations induce a few mainstream scientists to swim against the powerful current of orthodoxy? Here is one:

The grandmother effect. It is well-known that women who were on starvation diets__ - during the famine in Holland- during World War II gave birth to smaller-than- normal babies, and that this pattern of stunted growth persisted into the next generation.

(Vines, Gail; "There Is More to Heredity than DNA," New Scientist, p. 16, April 19, 1997)

Comments. Somewhere there are informa- ; tion carriers other than DNA, that much seems certain. But what are they?

If DNA does not carry aU of the information defining an organism, how does this fact affect the construction of cvolutionary family trees using DNA-sequencing?

GENOME-MAP USER BEWARE!

Omissions. Amid much hullabaloo, it was announced recently that the human genome has now been mapped. To every- one's surprise, we are said to be con- structed from blueprints containing only about 30,000 genes. But how accurate are these maps that were drawn up so hastily in the bitterly contested race between the publically and privately sponsored programs? How good are those ^ Computer programs that identified these "
30,0 or so genes?

Aecording to W. Haseltine, who heads Human Genome Sciences, "They're read- ing smudged text through foggy glasses." Haseltine's company claims to have found more than 90,000 human genes. Two other organizations have identified between 60,000 and 65,000 genes. A research group at Ohio State University at Columbus analyzed the same data used by the public consortium and estimates that there are actually human 80,000 genes! In fact, this groups avers, the public consortium's software seems to have missed 850,000 gene segments for which there already exists protein or RNA evidence.

The human genome map seems to harbor many terrae incognitae. So, we best not draw profound conclusions just yet.

(Kintisch, Eli; "So What's the Score?" New Scieñas[1] p. 16, May 12, 2001)

Errors. The genome-mapping efforts of both the public consortium and private company (Celera) depended heavily upon computers and software. That errors may have crept into Celera's map of the human genome via their software is sug- gested by analysis of Celera's earlier map of the fly genome. The same "shot- gun" approach was employed in both efforts. When S. Karlin, at Stanford, began using the fly genome map he spot- ted many errors. He has said,

> More than 60 per cent of their quences were in substantial disagree- ments [with known sequences], and this got me a little bit angry.

(Coghlan, Andy; "Shotgun Wedding," New Scientist, p. 7, May 19, 2001)

HOW THE GENOME'S MESSAGE CAN BE ALTERED

Our genómes (complemente of genes) can no longer be called sets of instruc- tions like those in a Computer program. Demonstrating the veracity of this state- ment are the following three quotations.

> Increasingly, a picture of inter- activity and multifunctionality among genes is emerging that preeludes such a simple one-to-one mapping. Further- more, the genome can exhibit considerable flexibility to adapt when the expression of a particular gene fails, and the interpretation of a mutant phenotype [life form] is also less trivial than it may seen. "Not only are behavioural phenotypes very sen- sitive to non-genetic influences," writes [R.] Greenspan, "but also the highly interconnected network of the nervous system sets up an additional layer of complexity between the gene and the realization of the phenotype." (Ref. 1)

> Many genes code for múltiple variants of the same protein. And many pro- teins are modified by adding sugar molecules, which play a big role in determining where proteins go and what they do. What's more, different proteins can join together to carry out completely new functions. (Ref. 2)

> A group of French biologists, led by Francois Jacob and Jaeques Monod showed that the gene's boundaries are fuzzier than had been thought and that genes are not restricted to chromosomes.

> Recently, biologists have found genes within genes, overlapping genes, and DNA sequences that specify one protein when read "forward" and another when read "in reverse."

> Muddling things further, the instruc- tions encoded in the DNA do not al- ways reach the ribosome as a literal translation. In a phenomenon known as RNA editing, an enzymatic highway- man intercepta the RNA message en route and alters it, so the resulting protein is not identical to that speci- fied by the DNA. (Ref. 3)

We can sum up by saying that a lot can happen to that information encoded in the genome before it is put to use.

(Ref. 1. Anonymous; "The Flexible Genome," Nature, 411:xi, 2001. Ref. 2. Coghlan, Andy; "Privatising Your Proteins," New Scientist, p. 5, April 14, 2001. Ref. 3. Comfort, Nathaniel C.; "Are Genes Real? Natural History, 110: 28, June 2001)

THE SECOND GENETIC CODE AND APPARENTLY A THIRD

Genes may or may not be switched on depending upon the addition of molecules called "methyl groups" to DNA. Now, a second kind of gene switch has been discovered on histones, a class of proteins .

> Figuring out when methylation of histones takes place has far-reaching implications; acting as a second genetic code, histone methylation may determine genetic traits such as the susceptibility to disease.

(Martindale, Diane; "Genes Are Not Enough," Scientific American, 285:22, October 2001)

Comment. So, beyond the first genetic code (the DNA) and the second genetic code (the recognized methyl groups), we now have some proteins (the histones) getting in on the act. And the show ain't over yet!

WHERE IS THE MAESTRO?

As we learn more and more about the gene complements of our planet's multi- tudinous life forms, the more it seems that the.vaunted genome may not incorpórate aU of the information necessary to construct a living organism. Despite assuranees to the contrary, we must ask if we really know the whole story.

These doubts manifest themselves as we see that creatures that are very much alike genetically may be radically different morphologically. In this vein, C. Yentner asserts that all higher ver- tebrates have roughly the same genes. The animáis that result from these re- markedly similar genomes depend upon when specific genes are turned on and off. Ventner says, "We have the same number of genes as cats and dogs, but differently regulated."

The genes themselves are supposed to be simply protein factories. Somehow, they are turned on and off ("expressing" themselves) in just the right sequences to help build the target animal. In a far-stretched analogy, the genes are the instruments in an orchestra and the proteins they produce are the notes in a symphony. But where are the symphony's score and its conductor? Very similar orchestras, it seems, can play radically different symphonies given different scores as interpreted by a maestro.

Each living thing is likewise a sym- phony of proteins, each played by the genome at just the right time. But just where are the score------doubtless an im- mense store of bytes-----and the con ductor? Does the genome reaHy hold all

the information required to maice *u* human rather than a mouse?

The foregoing paragraphs are doubt- less naive, but what better place to expresa doubts about paradigms? The two articles referenced below merely stimu- lated the contrary musings; they were not blasphemous in themselves.

(Cohén, Philip, and Coghlan, Andy; "Less Is More," New Scientist, p. 6, February 17, 2001. Ackerman, Todd; "Genetically Alike, Yet So Different," Houston Chronicle, Februarv 13, 2001. Cr. D. Phelps)

BIOLOGY'S "DARK MATTER"

Astronomy has its dark matter. We know what it does (at least gravitationally) but we cannot see it. Biology has a dark- matter equivalent in very tiny strands
oí RNA-----ónly 21-28 nucleotides long-— and, obviously, very diffieult to see. Unappreciated until very recently, these "micro-RNAs" do not encode proteins like most RNA but they do seem to be involved in gene regulation in some un- known way:

> ...lending some credence to the radi- cal idea that small RNAs hover 'above' the genome, providing a matrix oí regulatory control. (Reí. 1)

What a switch from the conventional picture of RNA molecules being mere "drones" that "take orders" from the genome to the ribosomes that then manufacture the prescribed proteins. These micro-RNAs seem to be higher than the genes in the hierarchy of biological Controls .

(Ref. 1. Anonymous; "The Genome's Guid- ing Hand," Nature, 420:732, 2002. Ref.
2. Baulcombe, David; "An RNA Micro- cosm," Science, 297:2002, 2002. Ref. 3. Couzin, Jennifer; "Small RNAs Make Big Splash," Science, 298:2296, 2002)

Comment. But, as we asked on p. 162, "Where is the maestro?" What directs the shape-shifting DNA, the many types of RNA, the folding proteins, all the enzymes, and those "chaperone" molecules? The different symphonies of life (i.e.; "species") played on earth during its long existence probably number a billion. Some talented maestro! (Incident- ally, said maestro need not have super- natural properties. Said maestro could be simply an "emergent" property of matter, or even a nonsupernatural intelligence we cannot begin to compre- hend.)

THE CHANGEOX PARADOX

The subject here is the human brain and its neural wiring. We put the Paradox in the form of a question:

> How do only 30,000 human genes determine 10^ cells with 10 con- nections?

The article's author kicks around some potential answers but ends by remarking that sequencing the human genome was easy, but figuring out what the genes actually do----codified their "annotation" --which is the real code of living things, will take centuries.

(Konner, Melvin; "Weaving Life's Pat- tern," Nature, 418:279, 2002.)

Comment. Origin of the paradox's ñame: Changeux, J.-P.; Neuronal Man; The Biology of Mind, 1997 translation by
L. Garey.
But where does this gene "annotation" arise?

LIFE IS SWEET

Jumping right off page 232 of the April 13, 2002, issue of Science News is the following heretical sentence:

> There's more to life than DNA and the proteins it encodes.

The implication is that our genome does not eontain the complete blueprint of our being and behavior.

Actually, the Science News article is mostly about sugar. These carbo- hydrates are sprinkled on almost every cell in our bodies and on many of its proteins as well.

These sweetened proteins relate to the sentence quoted above in that they are involved in protein folding. We know protein folding is not as interesting as subway-riding pigeons, but the millions of proteins being manufactured inside your body as you read this must be folded just right or you may suffer ill- ness or even cáncer.

A second quotation from the article elaborates upon the importance sugar-eoated proteins in the almost instan- taneous rolling up of a strip of tens of thousands of amino-acid molecules just slithering off the assembly line.

> Sugars also help explain how a string of amino acids consistently folds into a protein's three-dimensional shape— one of the more enduring mysteries in.biology. Studies have revealed that sugars can regúlate when a newly minted protein interacts with so-called chaperone molecules, which help it fold.

(Travis, John; "The True Sweet Science," Science News, 161:232, 2002)

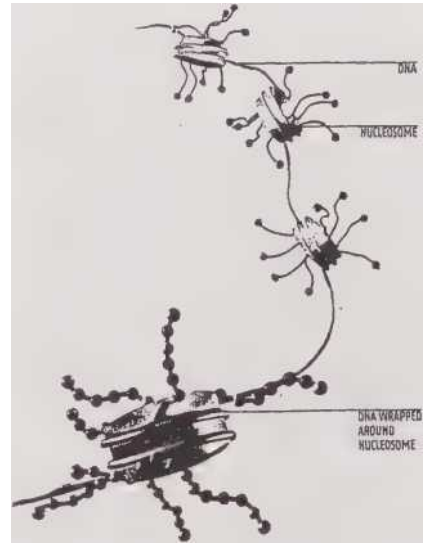
Comment. The arrangement of amino acids in a "newly minted" protein may be de- termined by the genome, but where do these "chaperone" molecules come from? What exactly do they do? If they are essential to protein folding, they must have existed before proteins! Does the genome eontain the information needed for their manufacture?

THE MASTER CODE

In several previous issues, we have harangued readers about an unidentifled "maestro" that conducts the symphony of life. We do this to dispel the popular conception that DNA provides aU the information needed to turn Üfeless matter into sentient creatures. In truth, DNA only provides a shopping list of mater- ials (mostly proteins) that must then be properly assembled and set into motion.

A "higher" level of coding is implied. That biologists are acutely aware of this missing upper tier of organization is obvious in this recent paragraph from the New Scientist.

> The answer seems to be another code, infinitely more subtle and mind-bendingly more complex than DNA's string of genetic letters. It is not even written in DNA; rather, it is encrypted in the structure of a family of proteins called histones. üntil a few years ago, histones were dismis- sed as little more than boring pack- aging for DNA. Now these proteins and their cryptic code have taken centre stage as the controllers that dictate when genes are switched on or off.



The DNA helix wraps around thousands of spherical nucleosomes—not quite two turns for each nucleosome. Each nucleo- some contains eight histone protein molecules, each with its tail dangling out. This long string of "beads" then coils into chromatin fiber that gets packaged into the chromosomes. Thus is stored the supposed "master code. " One has to wonder how information is "read out" of this tangle and why the histones are needed.

(Phillips, Helen; "Master Code," New Scientist, p. 44, March 15, 2003.)

But other scientists identify a totally different "maestro." These "revolution- aries" believe that it is RNA that directs gene regulation and expression!

(Dennis, Carina; "The Brave New World of DNA," Nature, 418:122, 2Q02.)

GOING 4D: CHRONOMICS

"Chronomics" is a new buzz word in biology. Why?

> Animal development is, in fact, no- thing but time. From the cell eyele to the beating of the heart, our own lives are composed of a multitude of

> microscopio and molecular oscillations. ... The animal dock is made up of a variety of counting mechanisms that follow varied temporal rules at different frequencies and often run in parallel without any apparent inter- action with eaeh other. The goal of the developmental dock is not simply to mark off time, but to intégrate and unify the myriad temporal signáis received from throughout the organ- ista .

Somehow, all these docks, frequencies, and schedules must be inherited through DNA, How are they encoded therein?

(Duboule, Denis; "Time for Chronomics?" Science, 301:277, 2003)

UNKNOWN SOURCE OF ANIMAL DIVERSITY

It has been burned into every student's mind that genetic mutations are the main source of the millions of species of life that now live have lived on this planet. Maybe this is not so!

M. Levine and R. Tjian have ob- served that whole-genome sequences are now known for animáis from worms to humans. Comparison of said genomes re- veal a remarkable constancy in genes across this broad spectrum of life. Even though vertébrate genomes are about twice the size of invertebrate genomes, the increase is due primarily to gene duplication rather the introduction of genetic novelty. They then ask:

> How, then, has evolutionary diversity arisen? Emerging evidence suggests that organismal eomplexity arises from progressively more elabórate regula- tion of gene expression.

(Levine, Miehael, and Tjian, Robert; "Transcription Regulation and Animal Diversity," Nature, 424:147, 2003.)

Comment. The obvious next question is: ' Whence this more elabórate regulation of gene expression? What "forcé" is manipulating this common reservoir of genes—worms to humans—to ñll our planet (and perhaps other milieus) with burgeoning, marvelously diverse forms of life?

THE OLD VIKING BONES LIED

It surprised the anthropologiste when 1000-year-old Viking bones in England yielded mtDNA suggesting that one-third or more of them had Middle Eastern ancestry. We do know that the Emperors of Constantinople did employ Vikings in their famed Varangian Guard, but there exists no historical evidence that these warriors ever returned to northern Europe with women and children from the Middle East. Something was wrong, and it seems to be in the mtDNA itself.

mtDNA is always mutating, but in a living creature the body is quick to re- pair defects. After death, though, mtDNA changes due to Chemicals and ionizing radiation are not attended to. These changes accumulate and may dis- tort human histories based on genetic material extracted from oíd bones.

While the anthropologiste may be dismayed by such distortions, the biologists are intrigued. It seems that the genetic alterations after death occur most frequently in just those areas of the genome that have changed the most during human evolution. In other words, Human genomes (and also those of other species) inelude "hot spots" prone to change—even though the forces of mutation (e.g., ionizing radiation) are applied roughly uniformly across the entire genome. The message here is that biological mutation may not be random; that is, certain types of changes are more probable than others.

(Gilbert, Tom; "Death and Destruction," New Scientist, p. 32, May 31, 2003.)

Comments. First, we must be wary of far-reaching conclusions drawn from genetic material gleaned from very oíd skeletons.

Second, it seems from the above that evolution occurs only when a body's repair erew fails to patch up a damaged genome. Do we daré say that humans evolved only when our ancestors' genetic repair machinery failed? Could evolution be driven by biochemical failures?

THE SHAPE-SHIFTING ICON

The icón of interest here is DNA. Its twisty strueture has been reproduced endlessly by the media. However, its unpublicized characteristics, which we are now about to reveal, especially its unexpected dynamism, are also found in most of those long biomolecules that are the foundation of terrestrial life.

The list ineludes RNA's strings of nucleotides and the lengthy chains of thou- sands of amino acids that constitute most proteins.

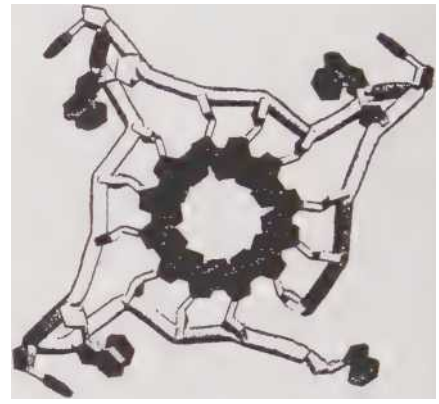
But DNA is our focus. This biological icón is pictured in models, books, and the minds of biology students as a stiff, immutable, vertical, double helix.

First, we observe that DNA really must be highly flexible because its two- meter strings of nucleotides have to somehow be squeezed into cells a million times smaller! This magician's act pro- ceeds thusly:

> DNA wraps itself around histone proteins to form a modular strueture cal- led chromatin, which in turn coils up like an overtwisted string into globular chromosomes.

That venerable icón is swallowed up by the cellular machinery.

Most surprising though is DNA's shape-shifting. The famous double helix sometimes metamorphoses into a curious propeller shape for some unknown reason. This propeller configuration is only one in a whole class of nonhelical forms of DNA called "G-quadrupoles." These dif- ferent DNA shapes seem to be involved in gene expression, but we know little



Human DNA sometimes assumes the above curious "propeller-like" configuration rather than the venerable, repeatedly figured, double helix.

more than that about these weird con-figurations.

In short DNA is far from being that static icón, that immutable carrier of inherited information. It is instead a dynamic, ever-changing player in the maelstrom inside the ceU. We do not know all the parts it plays.

(Pearson, Helen; "Beyond the Double Helix," Nature, 421:310, 2003.)

ORIGIN OF LIFE

You wi|| find only doubts in the text below about that renowned "warm little pond"- where earth's life supposedly got its start. Instead, some iconoclasta are looking much deeper into the earth's crust and along the ocean-floor's hydrothermal vents for life's point of origin. Others have speculated that life's Chemicals and templates might have drifted to earth on cometary debris. Another notion has it that life is an "emergent" pro- perty of matter; that is, atoms and molecules just happen to have propei — ties such that they spontaneously and naturally self-organize into life forms.

We divide pertinent digests from the 1994-2004 issues of Science Frontiers into the following four categories:

•Extreme-environment origin. Especially sea-floor vents

•Life as an emergent property of matter. (See Chapter 7 for examples of self-organization of complex .but non-living structures.)

•Panspermia. Biochemicals and even living organisms arriving on cometary and asteroidal debris.

•Speculative "othei life" possibilities. Carnot creatures.

EXTREME-ENVIRONMENT ORIGIN

ROCK-BASED LIFE

Virtually all biology textbooks insist that all terrestrial life ultimately de- pends upon sunlight for its survival.
The eeosystems elustered around the deep-sea vents and the bacteria found in deep aquifers demónstrate that the sun is not essential to life-------Chemical energy does just fine.

In fací, the domain of ehemosynthetic life has now been extended to a Roman- ian cave that has apparently been al- most completely sealed off from surface influences for 5.5 million years. Air does leak in through tiny cracks, and water partially filis the cave. What is most remarkable in this sunless, sealed ecosystem is its biodiversity: 48 animal species, including 33 brand-new species. The roster ineludes isopods, a millipede, a centipede, a water scorpion, and a leech. Of course, bacteria and fungi thrive there, too.

In contrast to unsealed caves, where inseets, bats, and other sources of food filter in from the surface, life in the Romanian cave seems to derive entirely from hydrogen sulfide present in the cave's rocks. This compound is consumed by microorganisms, whieh are then grazed by cave oecupants higher up the food chain. A NASA scientist has called Movile cave a "Mars analog site." And indeed it might be, for Mars has plenty of rocks and subsurface water.

(Skinrud, E.; "Romanian Cave Contains Novel Ecosystem," Science News, 149: 405, 1996)

Comments. Fluid-filled cracks and pores extend miles down below the earth's sur- face. It would be surprising if novel eeosystems do not exist there, too. The ice-sealed Antarctic lakes (below) may also surprise biologists. As for outer space---a realm pulsing with energies of many kinds----we can imagine that matter has assumed many unfamiliar forms, some of whieh we might cali "life."

LIFE IN RARE AND EXTREME ENVIRONMENTS

K.H. Nealson has been wondering how terrestrial life forms might fare in the more extreme environments of Mars. In his review, he looked at four spots on earth where life has adapte d to condi- tions that certainly seem extreme to air- conditioned, furnace-warmed humans.

•Antarctic dry valleys. Perhaps the most arid places on earth. Organisms live inside rocks. (Ref. 1)

•Antarctic dry-valley lakes. Even though permanently ice-covered (about 4 kilometers thick on Lake Vostok), bacteria and alga mats survive, (Ref. 1)

Recently, abundant, free-floating, extra-cellular viruses were discovered in these lakes. Their hosts (cellular life is needed for viruses to reproduce) are unknown. (Ref. 2)

In the ice itself, small pockets of melt water created by sunlight act as tiny "oases" of life, even though tem- peratures rarely exceed -20°C. (Reís. 3 and 4)

•Hydrothermal systems. Tube worms, shrimp, and many other species thrive at these hot spots on the floors of the oceans. Chemical energy rather than sunlight is the basis of life. (Ref. 1)

•Deep-subsurface eeosystems.

Such eeosystems may be abundant in the subsurface of the Earth, forming a major deep biosphere that operates independently of the surface in the sense that the energy is geothermally generated and the only electrón ac- ceptor needed is CO_2 whieh is avail- able from the carbonate rocks. (Ref. 1)

Goodbye warm little pond. The four terrestrial environments mentioned above certainly seem hostile to life, but it's all a matter of what one is used to. Darwin supposed that life might have originated in a warm little pond, but scientists are now considering other "eradles of life." Some of these may be fertile and fecund today!

Instead of "eradles," there may be "crucibles of life." In this vein, a Germán chemist, G. Wachtershauser, has combined the Chemicals found boiling up through the deep-sea hydrothermal vents and observed a series of Chemical re- actions he likens to metabolism. (Ref. 5) At the other end of the temperature spectrum, Lazcano, a researcher in pre- biotlc chemistry at the University of México, envisions a coid origin for life. His research suggests that might have appeared in the frigid environments of ancient Mars or present-day Europa. (Ref. 3)

The gist of these meandering para- graphs is that we have a very narrow view of life, what it is, where it can survive, and where and when it might original e.

(Ref. 1. Nealson, Kenneth H.; "The Limits of Life and Searching for Life on Mars," Journal of Geophysical Research," 101:23,675, 1997. Ref. 2. Ano- nymous; "Exotic Marine Life in a Frigid Desert," Science, 279:660, 1998. Ref. 3. Psenner, Roland, and Sattler, Birgit; "Life at the Freezing Point," Science, 280:2073, 1998. Ref. 4. Priscu, John C., et al: "Perennial Antarctic Lake Ice: An Oasis for Life in a Polar Desert," Science, 280:2095, 1998. Ref. 5. Radetsky, Peter; "Life's Crucible," Earth, 7:34, February 1998)

ARE WE MERELY FANCY CRYSTALS?

Just about everyone will concede that when sodium and chlorine atoms arrange themselves to build salt crystals that they are simply obeying the weH-known laws of physics. In other words, salt crystals are "natural." "Intelligent de- sign" need not be invoked in explaining their existence.

This is OK for salt crystals but can we say the same for biological forms such as proteins and, ultimately, human beings? Are these more complex biological forms also natural; that is, reducible to and explainable by the laws of physics? Human beings certainly seem irreducible; and some proteins are so large and complex that one. is unsure that physics is up to the task of ex-

plaining these tangled structures con- sisting many hundreds of atoms.

Some of these doubts have been re- lieved by recent advances in protein chemistry. It appears that the different types of protein folds, which number in the thousands, can be classified and sorted into distinct structural families —just like the much simpler crystais of salt, quartz, galena, etc fall into orderly dasses. The clear implication is that protein folds and, by extensión, via further research, the protein molecules themselves, are also natural and redu- cible just like the salt crystais.

If proteins are natural, perhaps even more complex biological forms are also, and so on up the eomplexity ladder to viruses (which often look like crystais through the microscope), bacteria, and even (gasp!) mammals. This is, of course, reductionism in the extreme.

But the successes with protein folding have led two New Zealand biochemists to speculate as follows:

> If it does turn out that a substantial amount of higher biological form is natural, then the implications will be radical and far-reaching. It will mean that physical laws must have had a far greater role in the evolution of biological form than is generally as- sumed. And it will mean a. return to the pre-Darwinian conception that underlying all the diversity of life is a finite set of natural forms that will recur over and over again any- where in the cosmos where there is carbon-based life.

(Dentón, Michael, and Marshall, Craig; "Laws of Form Revisited," Nature, 410: 417, 2001)

Comment. In the limit, then, R. Dawkins' "blind watchmaker" becomes a sculptor of incredibly complex cystals. The Services of neither God ñor that fabled "intelligent designer" would no longer be needed, as in the usual reductionist view of the universe.

A DEEP-SEA HYDROTHERMAL VENT INSTEAD OF A WARM LITTLE POND?

If earth life didn't arrive from outer space, it may have arisen a couple miles below the ocean's surface at hydrother- mal vents. The curious glows recently remarked at these vents (below) have stimulated much speculation as to the potential role of these glows in the origin of life:

> The history of hydrothermal activity predates the origin of life, and light in the deep sea has been a continu- ous phenomenon on a geológica! time scale and may have served either as a seed or refugium for the evolution of biological photochemical reactions or adaptations.

Scientists are still pondering how these glows are created. Some of the light is obviously blackbody radiation from the very hot (350°C) water but:

> .. .other potential, narrow-band sources of light may be superimposed on the blackbody radiation spectrum, including crystaloluminescence, Ceren- kov radiation, chemiluminescence, triboluminescence, sonoluminescence, and the burning of methane in super- critieal water.

(Van Dover, Cindy Lee, et al; "Light at Deep Sea Hydrothermal Vents," Eos, vol. 75, 1994)

Comment. If coid, diffuse molecular clouds in deep space can synthesize glycine, imagine what the hot, chemical- ly-rich fluids around hydrothermal vents might be able to do.

THE GLOW BELOW

Is there such a thing as sunless photo- synthesis? Did photosynthesis evolve at the earth's surface or deep in the oceans near hydrothermal vents? Such questions are engendered by the strength of the mysterious glow that emanates from these deep-sea vents. It is at these cracks in the oeean floor that very hot, mineral- laden water gushes forth, and where coloides of bizarre tube worms, blind shrimp, and hyperthermophilic (high temperature-loving) bacteria thrive.

(For details, see vol. 1, p. 238.)

The first anomaly is the strength of the glow itself. It is not all thermal radiation emitted by the 350°C water spewing forth from the vents; in fact, it is 19 times more intense than expected from theory. Something else is contribu- ting energy, but no one knows what it is so far.

The unexpected intensity of the vent glows also asks some provocative questions of the biologists:

- Is the glow strong enough to sup- port photosynthesis? Quite likely, seems to be the answer.
- Are life forms in the vicinity of the vents employing photosynthesis? We don't know yet, but some bacteria do photosynthesize.
- Might not life and perhaps photo- synthesis, too, have originated at the vents rather than on the planet's surface? This is an attractive possi- bility, because very early in the earth's history the surface was con- tinuaUy blasted by meteorites, comets, etc. ---------a very inhospitable place.

The above questions are so fascina- ting that we might easily neglect another vent anomaly; one involving those blind shrimp. Like many cave creatures, these shrimp disp ensed with eyeB long ago.

This being so, how do they find the vents, those rich oases of energy and food on the otherwise bleak sea floor? Rather than re- evolve their eyes, they "soraehow" grew light-sensitive patches on their backs. Apparently, these patches guide the shrimp to the vents.

(Monastersky, Richard; "The Light at the Bottom of the Ocean," Science News, 150:156, 1966)

Comments. Anomalists instinctively re- cognize that the "somehow" in the above paragraph glosses over formidable problema. We suppose that a few eyeless shrimp originally blundered into a deep- sea vent, and those that were lucky enough to be favored by the long se- quence oí random mutations that led to the light-sensitive patches on their backs outcompeted their unlucky com- panions. Assuming this happened at a single vent somewhere in the Stygian darkness of the sea floor, how did the mutated shrimp find the other glowing sea-floor vents hundreds of kilometers away? Their back patches cannot be that sensitive!

TWO CREATIONS OF LIFE?

The lifeforms ealled Archaea and Eubac- teria follow radically different life styles. The former are very happy in such extreme environments as the salty Dead Sea and the sea-bottom, hydrothermal vents; the latter prosper in bad hambur- gers and your gut. Despite their differ- ences, they have always been thought to have evolved from a common ancestor.

A more subtle, fundamental difference has now been found. Note on p. 170 how some terrestrial life forms do incorpórate right-handed molecules in their structures, especially in cell membranes? The ubiquitous Eubacteria do this. In the Archaea, however, the same structural components of the cell membranes (glycerophosphates) are left-handed. A subtle difference, but one with deep implications.

Some scientists maintain that it is impossible for two organistas relying upon mirror-image versions of the same molecule to have evolved from a common ancestor. Their genomes must be funda- mentally different. Conclusión: the Archaea and Eubacteria must have evolved separately, and from different biological wellsprings----that is, "creations."

Such thinking is anathema. M. Kates, a Canadian evolutionary biologist, is skeptical.

> Both the physics and chemistry of membranes are so complex that I would regard it as highly improbable that they could have auto-assembled twice.

(Barnett, Adrián; "The Second Corning," New Scientist, p. 19, February 14, 1998)

Comment. Both opinions rely upon wild probability guesses, as do all opinions . regarding the creation and evolution of life.

PHOTOSYNTHESIS AT DEEP-SEA VENTS

The surprisingly rich populations of lifeforms that prosper aroúnd the hydrothermal vents have been thought to be utterly dependent upon Chemical energy for their survival. Such now seems to be a limited view. There is light at the bottom of the ocean!

> Of particular interest is the potential for deep-sea vents and subsurface environments to support geothermally (rather than solar-) driven photosynthesis. Recent work on ambient light conditions at hydrothermal vents indi- cates that the photon flux generated by thermal radiation of 350°C water should be sufficient to sustain low- level photosynthesis, and there is at least one report of a faculative photo- troph isolated from water samples taken near a deep-sea vent.

A particularly important implication of this undersea light source is that the evolution of photosynthesis need not have been dependent upon the existence of llfe on land. Also, hydrothermal vents could have served as refuges for photosynthe- sizing life forms down the geological eons when:

(1) Ocean surfaces were ice-covered;

(2) The terrestrial surface was exposed to deadly levels of radiation, as when the ozone layer was destroyed; and

(3) When volcanism or dust from meteor impacts blackened the skies.

(Van Dover, Cindy Lee; "Biology in Extreme Envlronments at Deep-Sea Hydrothermal Vents," Eos, 70:F54, 1998)

LIFE AS AN EMERGENT PROPERTY OF MATTER

LIFE AS A COMPLEX OF "DOMINANT STATES"

To say that life is an "emergent pro- perty" of matter seems to have no more explanatory power than any of the other "origin" scenarios. It is lese than satis- fying. Be that as it may, scientists are now seeing some strange things happen- ing on the "mesoscopic" scale; i.e., from a few nanometers to a few millimeters (10^{-9} to 10^{-9} meters). This size range lies between the realms of quantum mechanics and macroscopic physics. May- be these curious phenomena do have a bearing on how life started and whether it is really different from nonlife.

Example 1. G. Whitesides, at Harvard, has dumped large quantities of millimeter- size iron bails into a plástic dish and then spun a bar magnet under the ensemble with startling results.

> The balls swarm around inside the plástic dish as the magnet rotates.
> At first the swarm is disordered. But after a minute, it breaks up into a set of concentric rotating rings. With- in each ring, the balls follow one another along precise tracks, as if hugging the rim of an invisible rou- lette wheel. Soon the balls in each track are perfectly equidistant. FinaHy, one ball in each ring comes to a dead stop. The other balls in each track line up behind the leader in a tiny are, even though the magnet is still whirling away below.

Example 2. In water large, fatty mole- cules (phospholipids) are observed to self-assemble into double layers with their water-loving bonds pointing out- wards. This sort of structure closely resembles that of the biological mem- ^ branes so vital to terrestrial life. This structure self-assembles!

It seems that on the mesoscopic scale, under certain conditions, ensembles of partióles (e.g., iron balls and large molecules) may snap into "dominant States" that exhibit unexpected proper- ties.

In this context , Nobelist R.' Laughlin remarks:

> The discoveries that matter are the grand surprises that occur when matter organizes itself.

Of course, the question has always been whether something "special" or "vital" has to be done to an ensemble of molecules to confer life upon it. In his Darwin's Black Box, M. Behe insists that life is irreducibly complex and re- quires intelligent design. This is seen as a cop-out by most scientists who are searching for "natural" explanations for emergent properties of matter—such as life.

To this end, H. Frauenfelder and P. Wolynes, both at the University of California at San Diego, have been mapping the "energy landscape" of proteins as these long chains of amino acids fold into the incredibly complex shapes re- quired by their functions in life forms. They find energy peaks and valleys are crossed as the chains writhe and fold. From one energy state to another, the nascent proteins "funnel" toward the minimum energy States that characterize the proteins that are ready to take on biological tasks.

This funnelling is an emergent pro- perty of matter that leads to the final "dominant state": a protein or some other biochemical.

(Irion, Robert; "Say the Magic Words," New Scientist, p. 32, June 7, 2001)

Comment. Proteins are the workhorses of terrestrial life forms. By gross extrapo- lation of the protein energy-landscape model, we could say that life forms are merely complexes of multitudinous domi- nant States and are, in effect, super- dominant-states.

This speculation is fun, but the WHY of this whole business still eludes us. And we wonder if "emergent property" really doesn't mean "life forcé"!

PANSPERMIA

BALLISTIC PANSPERMIA

Scientists are already convinced that cratering events on the moon and Mars have propelled rocky debris in the di- rection of the earth, and that some of these fragmente have landed here in the guise of meteorites. A logical question is: Can life forms and/or Chemical precursora of life be transported thus across the far reaches of the solar Sys- tem? Can one planet infect another bal- listically? An analysis by M.K. Wallis and N.C. Wickramasinghe is rather warm towards this idea:

> The mass of escaping ejecta from the presumed 10-km comet that caused the 180-km Chicxulub cráter, with a radius of roughly 10 km and 1 m deep, amounted to --v300 Mm , of which one third may have been rock and 10% higher-speed ejecta that could have transited directly to Mars. It may have taken 10 Ma to impact Mars but...the probability is not ex- ceedingly low but 0.1-1%.
>
> The survival and replication of microorganisms once they are released at destination would depend on the local conditions that prevail. Although viability on the present-day Martian surface is problematical, Earth-to-Mars transiere of life were feasible during an earlier 'wet' phase of the planet, prior to 3.5 Ga ago. The Martian atmosphere was also denser at that epoch, with several bars of CO_2, thus serving to decelérate meteorites, as on the present-day Earth. Since the reverse transfer can occur in a similar manner, early life evolution of the two planets may well have been linked.

(Wallis, Max K., and Wickramasinghe, N.C.; "Role of Major Terrestrial Cratering Events in Dispersing Life in the Solar System," Earth and Planetary Science Letters, 130:69, 1995)

SPECULATIVE "OTHER-LIFE POSSIBILITIES

CARNOT CREATÜRES

Photosynthesis is the ultímate source of energy for most of the life forms we recognize here on earth. Sure, there are also a few creatures that derive their energy by oxidizing the sulfides dissolved in the 400° water gushing forth from deep-sea vents. We will cali them "geochemieal creatures" to sepárate them from the "photosynthetic creatures" we are more familiar with. But, in principie at least, there could also be "Carnot creatures", whose metabolisms depend upon temperature differences like almost all human-built engines. Some bizarre . animal, such as a meter-long tube worm, could plant one end on a hot rock surface and dangle the other in coid seawater to reject waste heat from its Carnot engine. Since thermodynamic-cycle efficiencies can approach 60% compared with only 10% for photosynthesis, evolution would have been remiss if it had not tried to evolve "Carnot creatures." For, as D. Jones comments below, Carnot creatures would be adaptable to many more habitats in the universe than photosynthetic crea- tures, which must have a sun with a very specifIc electromagnetic spectrum.

> Many worlds, from distant 'brown dwarf' stars to the satellites of giant planets, may have internal heating but no effective 'Sun'. If Carnot life is possible, it may well have evolved in such dark and distant places— making life abundant throughout the Universe. Indeed, our distant descen- dants may be able to harness Carnot biochemistry to sustain themselves on geothermal or residual brown- dwarf warmth when the Sun finally grows dim.

(Jones, David; "The Dark Is Light Enough," Nature, 385:301, 1997)

Comments. To our knowledge, those who search for extraterrestrial life do not consider the possibility of Carnot crea- tures and wouldn't recognize them if they stumbled across them or their signáis. For example, Carnot creatures might emit infrared signáis rather than radio waves; and they might be immense in size.

EVOLUTION

In Volume I of Science Frontiers, we were able to break down the 17-year collection of digests relating to evolution into several sensible categories. Here, in Volume 2, there are too many diverse themes embedded and mixed in the various árticles for this to be practical. We have, therefore, arranged the digests in chronological order.. • .

However, a list of the major themes dispersed throughout the following pages is possible:

- **Challenger to Neodarwinism;**
- **The Cambrian Explosión and doubts about it;**
- **Has homology been a failure?**
- **Restructuring the Tree of Life;**
- **Life's complexity and so-called Intelligent Design**
- **Adaptive evolution;**
- **The Anthropic Principie; and •Possible purpose in evolution.**

THE SHORTER, THE STRANGER

Just a few months ago (p. 169) . we held forth on biology's Big Bang: that Cambrian paroxysm of biological creativ- ity about 570 million years ago. üntü now, biologists had opined that this "explosión" required a rather leisurely 20-40 million years (still very short in geological terms). After all, biological creativity must take time if it is powered only by stepwise random mutations. But the recent dating of Cambrian formations in northeastern Siberia (which was pre- viously off limits to Western scientists because of its Soviet radar installations) has now compressed this great event to a veritable flash. S.A. Bowring et al, in their startiing report in Science, have measured the length of this period of unparalleled biological diversification at only 5-10 million years, possibly as short as a mere 1 million years! What wand of biological creativity was waved at this magical moment? It had to be something that has not happened again down the long eons that followed, for never again has nature favored our planet in this way. Never again were any more of life's major body plans (the phyla) synthesized. Even ardent evolutionists marvel at the newly measured intensity of this moment. For example, S.J. Gould has remar leed:

> You've taken the most accelerated period of evolutionary rates and made it a whole lot shorter. The degree of speed is so fast, it's downright peculiar. The strange gets stranger, the fast gets fáster.

(Bowring, Samuel A., et al; "Calibrating Rates of Early Cambrian Evolution," Science, 261:1293, 1993. Kerr, Richard A.; "Evolution's Big Bang Gets Even More Explosive," Science, 261:1274,
1993. Monastersky, R.; "Siberian Rocks Clock Biological Big Bang," Science News, 144:142, 1993. Yoon, Carol Kae- suk; "Biology's 'Big Bang' Took a Mere Blink of the Eye," New York Times, September 7, 1993. Cr. P. Gunkel)

Comment. It hardly seems necessary to ■ ask (as we often do in Science Frontiers whether the prevailing theory of evolution can aecount for such a flash of creativity.

THE WATCHMAKER IS NOT BLIND AFTER ALL!

Neo-Darwinists are chained to the pre- mise that evolution proceeds "blindly"; that is, mutations are random and un- related to the biological needs for sur- vival. This assumption is enshrined in R. Dawkins' book The Blind Watchmaker. Catchy though this title is, it looks more and more like the Watchmaker sees something.

For over a decade, experimente have hinted that those mutations that are helpful to an organism's súrvival occur more often than those that are not "adaptively useful." This controversial phenomenon is termed "adaptive muta- tion." (vol. 1, p. 180; vol. 2, p. 156)
A recent issue of Science presente two more papers that seem to confer the gift of sight on the oíd Watchmaker.

Biochemist J.A. Shapiro, in a com- mentary accompanying the two Science papers, highlights a significant feature of adaptive mutation in bacteria: The genetic changes involved are multi- cellutar. In other words, DNA rearrange- ments in one ceH are actually trans- ferred to other ceUs. But most profound of aH for the whole Science of biology is his sentence:

> The discovery that cells use biochemi- cal systems to change their DNA in response to physiological inputs moves mutation beyond the realm of "blind" stochastic events and provides a mechanistic basis for under- standing how biological requirements can feed back onto genome structure,

(Shapiro, James A.; "Adaptive Mutation: Who's Really in the Garden?" Science, 268:373, 1995)

Comment. Random mutation has been a linchpin of Neo-Darwinism because it is "scientific"; that is, non-supernatural.
We see in adaptive mutation that other scientific mechanismB may indeed exist that make biological evolution more than just a playtlüng of chance. Furthermore, since some species (You know who you are!) can modify environmental forces, these species can, in principie, control
their own evolution-----for good or bad—
and may in fact be doing just that.

I HISS THEREFORE I AM

E.R. Moliner, a neurologist, has writ- ten a curious yet provocative article for New Scientist. It is reaUy a not-too- subtle attack on the Anthropic Principie, Darwinism, and science's insistence that the universe must be purposeless.

He notes first that most proponents of the Anthropic Principie postúlate that, in the beginning (whatever that was!), many different universes may have been created. The only one we observe is the one offering just the right combination of properties for evolving Ufe and, es- peciaUy, humankind. If this or that phys- ical constant had been a tad different, humans would not have evolved. Even though humans obviously did evolve, it
was all purposeless-----just the way atoms and molecules happened to combine.

This outlook fits right in with Darwinism, for almost all Darwinists also see evolution as purposeless. It was bUnd chance that gave us the capabili- ties to build aircraft and tunnel into opposite sides of a mountain and meet in the middle. MoUner is highly skeptical that such amazing, "cooperative, adaptive" talents could have come about in an unbiased, purposeless universe.

Suppose, he asks, vipers were philo- sophically minded. They might look at their marvelously complex fangs with the canals inside, a nearby poison gland, a poison storage reservoir with special duets leading to the fangs, a fang-erec- tion mechanism, a set of muscles to squeeze the poison reservoir, and a nervous system to control the whole System, and conclude that there must be an Ophidian Principie at work in the universe for vipers to end up with all these neatly interconnected biological components!

Using the foregoing musings for a launch pad, Moliner assails Darwinism he.id on, employing the "what-good-is half-a-wing" and "complexity" argumente:

> It is easy to visualice how random mutations followed by natural selec- tion could lead to the right curva- ture of the fangs for better grasping of prey. But what would have been the selective advantage of the rest of the poison system if just one of its components had failed to evolve?
> To claim that it can be achievcd through unbiased evolution is Uke ex- pecting that nine independent miners can attack the core of Mount Everest from various points at the foot of the Himalayas and meet exactly in the middle without the guidanee of a sur- veyor.

(Moliner, E. Ramón; "'I Hiss Therefore I Am'," New Scientist. D. 48. November 11, 1995)

Comments. We will enjoy reading the in- evitable letters to New Scientist from evolutionists. Probably, too, creationists wiH now be quoting Moliner.

Even so, we see much discussion of "adaptive" or "directed" evolution in the scientific literature these days. See vol. 1, p. 180; vol. 2, pp. 156, 168.

PALEONTOLOGY VS. BNA

The so-caUed Cambrian Explosión has been the subject of two previous digests in Science Frontiers (vol. 1, p. 187).
A paleontological fact of life insists that all known body plans (phyla) seem to have evolved suddenly------within a few cnillion years—after the onset of the Cambrian period some 545 million years ago. Evolutionists are understandably uncomfortable with such a high rate of evolutionary innovation. Nothing like the Cambrian Explosión appears in the hundreds of millions of years of geologi- cal strata that followed. So rapid was speciation during the Cambrian Explosión that doubt is cast upon the accepted mechanisms of evolution: slow, stepwise accumulation of mutations plus natural selection. (Refs. 1 and 2)

But G.A. Wray and colleagues seem to have rescued Darwinism. They have analyzed the DNA sequences of seven genes found in living animáis. Assuming that these genes mutate at constant rates and working backwards in time, they calcúlate that animal diversification (i.e., when chordates diverged from in- vertebrates) actually began about 1 bil- lion years ago, rather than about 545 million years ago. This expansión of the time frame gives accepted evolutionary processes much more time to innóvate and create all those new body plans.
The evolutionists are pleased.

Three of the hundred-or-so basic body plans (phyla) : (left to right) jellyfish (Coelenterata) ; aphid (Arthropoda) ; and eohippus (Chordata). The available fossil record suggests that all but one phylum appeared rather suddenly in early Cambrian time.

The paleontologists, however, are in a quandry. They see nothing--------or very little----in the Precambrian fossil record that substantiates the claim of Wray at al. Thus, molecular biology directly contra- dicts the findings of paleontology. Not to worry say supporters of the new and much more comfortable scenario: The Precambrian animáis were so soft and "squishy" that they did not fossilize well. (Ref. 3)

Comment. The molecular biologists are a bit arrogant in their assertions. They seem to assume that because they can quantify molecular divergences; that is, fill their journal contributions with num- bers; that their data is more sound than fossiliferous strata. But their crucial assumption of constant DNA divergence in time may be their undoing.

(Ref. 1. Anonymous; "Deflating the Bio- logical Big Bang," Science News, 150: 335, 1996. Ref. 2. Perlman, David; "Origin of Animáis-----1.2 Billion Years Ago," San Francisco Chronicle, October 25, 1996. Cr. J. Covey. Ref. 3. Wray, Gregory A., et al; "Molecular Evidence for Deep Precambrian Divergences among Meta zoan Phyla," Science, 274:568, 1996)

HOMOLOGY YS. DNA

Until the molecular biologists recently arrived on the scene, evolutionary family trees were based upon similarities in appearance; that is, homology. Animáis that look alike must be closely re- lated. But molecular biologists have diseovered that some animáis that seem identical to the eye differ significantly in their DNA complements.

Thus, the Pacific skinks may under- mine homology. Inhabiting many, far- separated Pacific islands, these small lizards all look pretty much alike extern- ally. For many years, biologists assumed that they all belonged to the same spe- cies. Recently, scalpels in hand, they found that the skink innards differed enough to define two species: Emioa cyanura and Emioa impar.

Next, the molecular biologists got into the act. They diseovered that the mitochondrial DNA (mtDNA) of the Guam and Kosrae skinks differed by an ama- zing 6%, even though both skinks were E. cyanura. Even worse, the Vanuatu skink (E, impar) differed from aU other E. impar skinks around the Pacific by an astounding 13%. Yet, to the eye, they all looked alike. So much for homology ----unless tliere is something basically wrong with molecular biology. Biologists now suspect that there are many more "cryptic species": animáis that look alike but possess substantially different DNA complements.

(Cohén, Philip; "Lizards Keep Their Differences to Themselves," New Scien- tist, p. 17, July 6, 1996)

Comment. The flip side can be seen in humans and chimpanzees. From the stand- points of anatomy and behavior, these species are rather divergent; but their DNAs differ by only 2%! There is something suspicious in all this.

COMPLEXITY AND MODNT IMPROBABLE

In principie, the combination of random mutation and natural selection can ac- count for any level of biological complexity you wish to have explained. R. Dawkms' Mount Improbable is never too high to scale with this Darwinistic mechanism—if given enough time, of course. At times though, we have to wonder if there is not a cog railway or something similar to aid organisms as they ascend this Mount. Such thoughts aróse when reading C. Koch's Nature article on neurons and their networks.

Neurona are cells with three principal components: the cell body, the axons, and the dendrites. These cells and the networks underlie all of our perceptions, actions, and memories. The ways in which they store and procesa information has turned out to be much more complex and dynamic than previously supposed. Neural networks are so intricate that Koch was iropelled to conclude his review of current research with this paragraph:

> As always, we are left with a feeling of awe for the amazing complexity found in nature. Loops within loops across many temporal and spatial scales. And one has the distinct feeling that we have not yet revealed every layer of the onion. Computa- tion can also be implemented bio- chemically—raising the fascinating possibility that the elabórate regula- tory network of proteins, second mes- sengers and other signalling molecules in the neuron carry out specific com- putations not only at the cellular but also at the molecular level.

(Koch, Christof; "Computation and the Single Neuron," Nature, 385:207, 1997)

Comment. Thus, Dawkins' Mount Improbable is seen to be even higher and more majestic. Can it really be climbed via a random process edited by natural selection? Even if the answer is "yes," we must ask why atoms and molecules have just those properties that permit them to unite in the marvelously complex and sophisticated biological Computers de- scribed by Koch.

A THIRD WAY?

In the never-ending, ever-acrimonious "dialog of the deaf" between the Dar- winists and the Creationists, we are perpetually exposed to their extreme, non-negotiable positions. The Darwinists insist upon their one-gene/one-protein genome in which random mutations slowly accumulate and adapt living things to the changing environment. The Creationists only accept a one-time, supernatural creation of "kinds" plus minor adapta- tions ("microevolution").

J.A. Shapiro, a professor at the University of Chicago, is searching for a "third way," a scientific, non- Darwinian way. Shapiro maintains that five decades of genetic and molecular- biology research have transformed our visión of life. He compares the conceptual changes to those accompanying the transition from classical physics to relativity and quantum mechanics. This new theory of évolution—his "third" way—will emerge from the convergence of biology and information Science.

Genomes, asserts Shapiro, are not really the static "beads on a string" envisioned by the Darwinians. Rather, they are fluid and complex. Genes are now seen as multipurpose elements that turn on and off as required for the sur- vival and well-being of the organism they belong to.

In this paradigm-eroding paper (refe- renced below), Shapiro describes four categories of molecular discoveries that have revised our thinking about how evolution works: (1) Genome Organization; (2) Cellular-Repair Capabilities; (3) Mobile Genetic Elements and Natural Genetic Engineering; and (4) Cellular Information Processing. He then writes:

> The point of this discussion is that our current knowledge of genetic change is fundamentally at variance with neo-Darwinist postulates. We have progressed from the Constant Genome, subject only to random, localized' changes at a more or less constant mutation rate, to the Fluid Genome, subject to episodic, massive amd non-random reorganizations capable of producing new functional architectures. Inevitably, such a profound advance in awareness of genetic capabilities will dramatically alter our understanding of the evolutionary process.

Toward the end, Shapiro approaches, as he logicaUy must, the reaUy crucial point in the Darwinism-Creationism debate. Is there guiding intelligence at work in the evolution of life? He cannot

answer this question at this time, and neither can Science in general. He puts his hope for a definitive answer on the fact that we are now "on the threshold of a new way of thinking about living organisms and their variations." It is time, he says, for the Darwinists to abandon their "posture of outraged orthodoxy," to become real scientists, and to use the new insights we have gained about the workings of the genome and try to answer this most-fundamental of all the questions that face science.

(Shapiro, James A.; "A Third Way," Boston Review, February/March 1997.
Cr. D. Monerief)

TERRESTRIAL LIFE IS AMBIDEXTROUS

But only slightly so!

On p. 193, we asked whether right-handed organic molecules can be found in any terrestrial life forms. E. Clark answered as follows:

> D-amino acids [right-handed amino acids] do occur fairly often in bacterial cell walls and other microbial Products such as antibiotics. When I was first introduced to this fact, I was intrigued and I wondered if the presence of D-amino acids in these large molecules might indícate that there was something speeial about
> the way they were synthesized----- perhaps, for example, that they es-sentially assembled themselves without the need of individual synthetic en-zymes at each synthetic step.

(Clark, Ed; personal communication, February 28, 1998)

Comment■ So, right-handed molecules are not forbidden on earth, but we are still faced with that great preponderance of left-handed molecules. What "forcé" is at work here, or is this just the way things are? We should not settle for the latter interpretation.

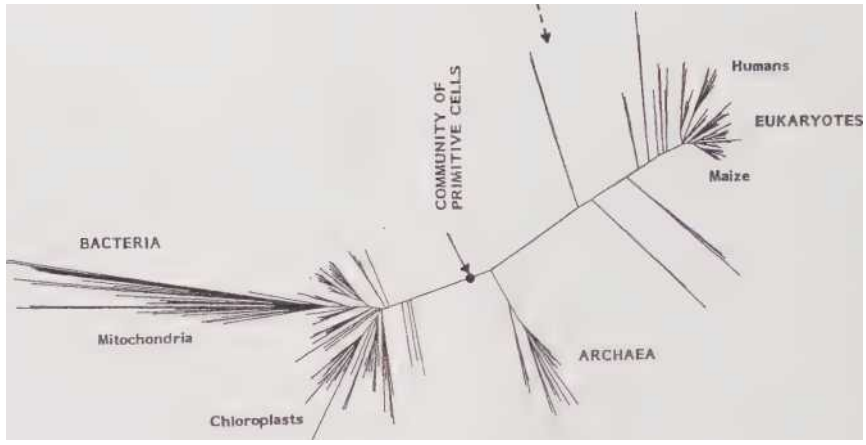
"ÜPROOTING THE TREE OF LIFE"

Yes, that is the title of a long article in the February 2000 issue of Scientific American. In the Table of Contenta, we see words concerning this article that we never thought would be permitted in a mainstream science magazine. After first noting that 10 years ago it was generally agreed that aU organisms evolved from a single ancestral cell that existed about 3.5 billion years ago, there comes the assertion that the Tree of Life:

> is far more complicated than was believed and may not have had a single root at all.

The article proper relates how the Tree of Life has its own evolutionary history. Twenty years ago, scientists had that single ancestral cell splitting into two main trunks: the prokaryotes (bacteria) and the eukaryotes (every- thing else). More recently, a third trunk has been grafted onto the Tree; namely, the archaea (microorganisms that look like bacteria but possess markedly different genes). The archaea favor extreme environments and, curiously, are more closely related to you and me than are the bacteria.

--POSSIBLE Ith "TRUNK"



The "Tree of Life" becomes more and more complex the more we learn about the living world, as this recent "tree" or "bush" demonstrates. Notes. All life forms to the left of the Archaea are prokaryotes; that is, the cells have no well-defined nuclei. However, the now-popular Kingdom Protista containing most algae, foramanifera, and many other simple, one-celled life forms is not shown at all. Taxonomy is obvious- ly a rather fluid endeavor!

But according to this article (by W.F. Doolittle), the triple-trunked Tree of Life is simplistie. One reason for this is that genes, once thought to flow only from parent to progeny, are now known to travel lateraUy. Species barriers are broken. Genes jump from trunk to trunk, from branch to branch, twig to twig. Of course, these jumps are seen primarily among the microorganisms. The real Tree of Life, then, is more like a snarl of vines—a üungle of Life, a genetic Tower of Babel!

Furthermore, no longer does the multiplicity of life forms spring from a single primordial cell but rather from a "common ancestral community of cells."

Complicating the picture still further, many eukaryote genes are totaUy unlike those seen in the prokaryotes and archaea. They "seem to come from no- where." "Nowhere" migrit really be a fourth trunk supporting what is now seen as a confused tangle of vegetation.

(Doolittle, W. Ford; "Uprooting the Tree of Life," Scientific American, 282:90, February 2000)

Comment. That "ancestral community of cells" could have been formed from more than one (nonsupernatural) creation and/or múltiple infusions of life forms and/or biochemical templates conveyed to earth by comets and meteorites. In other words, the Tree of Life may also have had (or still has) extraterrestrial roots, making life truly a cosmic phenomenon.

LIFE'S BIOCHEMICAL ENFORCERS

In his book Darwin's Black Box, M. Behe reminds us that each of the human body's many thousands of different bio-chemical reactions requires the presence of a specific enzyme (a type of protein) to forcé the Chemical marriage, which otherwise would not take place. We frequently read about enzymes in news-papers and hear of them on TV, but we do not fuHy appreciate how many thousands of different enzymes are required to make our bodies (Which are really huge, complex biochemical machines.) function successfully.

But there is another class of biochemical "enforcers" that somehow escapes the popular science writers: the molecular "chaperones." The role of the chaperones is helping proteins—often many thousands of amino acids in length —fold into the proper shapes and main- tain these shapes while accomplishing their assigned tasks. A properly folded protein may look to us like an irregular clump of molecules, but somewhere on
its surface it fits------key-in-lock style------ with other Chemical entities. The fit must be exact. The chaperones make sure it is.

Given that 100,000 or so proteins labor away in the human body, the army of chaperones keeping them under control is likewise huge.

To illustrate the problems that cha-perones face, human hemoglobin consiste of alphn- and beta-globin chaina. Curi- osly, the alpha globins are encoded on chromosome 16, while the betas come from chromoBome 11. The hemoglobin chaperone must match up alphas and betas and see to it that they are properly folded up along with the haem (a non-protein). Thus bundled, the complete hemoglobin molecule will efficiently collect oxygen from the lungs and release it where it is needed throughout the body.

(Luzzatto, Lucio, and Notaro, Rosario; "Haemoglobin's Chaperone," Nature, 417: 703, 2002.) ----------

Comments. Manifestly, chaperones must somehow sense the shapes of their charges and be able to rocognize and correct any misfolding. In our innocence, we must ask: Which carne first, the chaperone or the protein it watches over? Since chaperones are also proteins, do they also have their own chaperones? Etc.? '

DID ID HA VE DIMENSIONAL LIMITS?

ID (for "Intelligent Design") is a hot topic in evolutionary philosophy, Some scientists, such as M. J. Behe and W.A. Dembski, exhibit many examples of what they term "irreducible complexity" in terrestrial life forms-----biochemistry in particular. These, they claim, necessi- tated the application intelligent design by some "unspecified" entity. ID op- ponents assert that natural, random processes and natural selection are suf- fícient to have created everything we now observe in our world, limited though it may be. But, surprise, hot as this subject may be, we other species of fish to fry in this Ítem.

We have netted two intriguing articles from the Creation Research Society Quar- terly that deserve the attention of anom- alists and even the most fervent redue- tionists---whatever their philosophical predilections.

In the first article, W.I. Sivertsen takes four criteria established by C. Sagan for the recográtion of intelligent signáis from space. These criteria are basic to the SETI (Search for Extra- Terrestrial Intelligence) project. The four criteria are:

- **Elegance;**
- **Complexity;**
- **Internal consistency; and •Possessing "utterly alien" charac- teristics.**

Sivertsen applies these SETI criteria to DNA and finds that DNA easily meets them. We cannot deny that DNA is geo- metrically elegant, chemically complex, and possesses internal consistency. But is it "utterly alien?" Sivertsen so claims in these words:

> **The fourth criterion raises several complex questions. Does "alien" mean another rational mind besides a human mind? If so, we would need ways to distinguish these non-human signáis and to classify them as "intelligent." In the case of DNA, I submit that the determinative code relationships evi- dent between codons, anticodons, and the amino acids in the resulting proteins are complex in a manner that is different or "alien" in comparison to the symbolic code relationships in human code systems.**

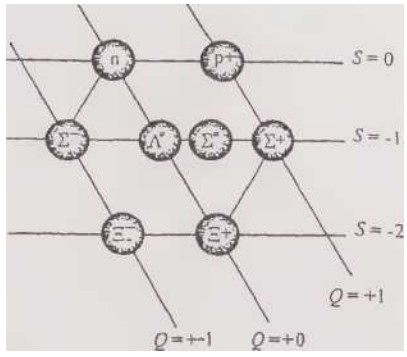
Sivertsen's conclusión, as one would expeet, is that DNA is the product of an intelligent designer.

(Sivertsen, Walter I.; "SETI and DNA," Creation Research Society Quarterly, 39: 190, 2002.)

In an earlier article in the same jour- cal, J. Bergman and D.B. DeYoung make a similar case for intelligent design in the realm of subatomic particles------those fundamental [?] building blocks of matter Although, they do not employ Sagan's exact terminology, we will do so as we mention some of their examples.

- **Elegance (the neat 8-fold way);**
- **Complexity (the existence of over 500 different subatomic particles); •Internal consistency (the symmetry and conservation rules);**
- **Utter alien-ness (dark matter, dark energy, etc.)**

Like Sivertsen above, these authors conclude that the subatomic realm was intelligently designed.



The elegant representation of the eight- fold- way pattern for the eight spin-í baryons. The circles represent different subatomic particles. Q = charge.

(Bergman, Jerry, and DeYoung, Don B.; "Particle Physics and Paley's Watch," Creation Research Society Quarterly, 39:73, 2002.)

Comments. This is all intriguing, but intelligence is a human construct. Why should aliens be intelligent by our defi- nition? They may be "more-than-intelli- gent" or "other-than-intelligent."

SETI searches for electromagnetic messages from outer space. We have not heard any signáis of this sort, but we do find amino acids in meteorites; maybe, eventually, we'U discover meteor-borne DNA, too. Perhaps amino acids and DNA are really messages from some intelligent entity ----------who need not be supernatural.

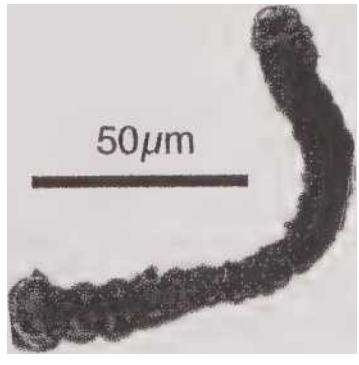
We can also apply Sagan's four criteria to cosmology (greater dimensions than earth life) and, in the other direc- tion, to whatever smaller "things" make up the subatomic particles.

LAB-MADE MICROFOSSILS

If this title is true, it's bad news for claims of fossilized life forms in ancient terrestrial rocks and in one particular meteorite from Mars.

The seience news media have focussed repeatedly on Martian meteorite ALH84001 which contains objects that look very much like fossil bacteria. If these objects are truly biogenic, the earth would no longer be the only planet where life exista or did once exist.

But experimente conducted by J.M. Garcia-Ruiz et al impresa upon us how eareful we must be in claiming biological origins for objects just because they look biological. Garcia-Ruiz et al have synthesized fossil-like minerals by simply mixing á barium salt in an alkaline sodium- silicate solution and adding a touch of simple organics, all under the ambient atmosphere.



Presto! Silica-carbonate structures self- assembled; and one cannot reliably distinguish them from the putative micro- fossils in ALH84001and in two types of terrestrial rocks 3.5-billion years oíd and supposedly the oldest fossils on this planet.

(Garcia-Ruiz, J.M., et al; "Self-Assem- bled Silica-Carbonate Structures and Detection of Ancient Microfossils," Science, 302:1194, 2003. Kerr, Richard A.; "Minerals Cooked Up in the Laboratory Cali Ancient Microfossils into Question," Science, 302:1134, 2003)

Comment. Obviously, morphology is a poor biomarker in the search for extra- terrestrial life. It can also be misleading when constructing evolutionary scenarios for terrestrial life.

WHAT ELSE IS MEANT TO BE?

The author of the article under review. S.C. Morris, was a frequent opponent of S.J. Gould. The latter was convinced that evolution was directionless and totally at the mercy of circumstance and coincidence. Contrarywise, Morris sees deep "structure" in the paleontological record of life on earth, although he freely admits that life's history seems impossibly complex and unpredictable.

The "structure" perceived by Morris is epitomized by biological convergence. In convergence, diverse and unrelated organistas facing the same ehallenges come up with nearly the same Solutions. Morris asserts:

> **My view is that the ubiquity of con- vergence makes it crucial for the understanding of the history of life. It allows us not only to confirm what must exist but also to infer what can never exist. It provides a set of signposts to the highway of life.**

He then cites some admittedly remark- able convergences:

- **Camera-type eyes (like our own) evolved independently at least seven times.**
- **Two groups of fish, one in South American waters, the other in Africa, have developed identical equipment for the generation of electrical signáis and for processing the resulting data in both navigation and communication.**
- **Complex information processors (brains) are common in the animal world.**

Morris builds on the latter:

> **Minds, therefore, are not accidente of evolution, and the same is probably true of advanced intelligence.**

Toward the end of his article, Morris declares that which is anathema to ah evolutionists:

> **Convergence means that life is not only predictable at a basic level, it also has direction. If our type of in- telligence is inevitable, then so too are other associated evolutionary _ ■ features that help define what it is to be human.**

Furthermore, Morris does not see humans as the final product of evolution.

(Morris, Simón Conway; "We Were Meant to Be...," New Scientist, p. 26, Novem- ber 16, 2002)

Comments. Convergence at this moment may be fashioning entities divergent from the human line. Such entities could be endowed with a capability different from and better than intelligence.

Astronomers have reeently been shocked at the (postulated) existence of "dark" matter and "dark" energy. Be- yond humans may lie "dark" entities and "dark" intelligence.

Chapter 4 GEOLOGY

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TOPOGRAPHY

CRATERS AND DEPRESSIONS

Like a snow-capped mountain, a gaping cráter in the earth's surface quickly captures the traveler's attention. Meteor Cráter, in Arizona, is a prime example, being a favorite tourist.attraction. But Meteor Cráter, only a mile or so wide, is too smali to be called anomalous; neither is its origin contentious. To qualify for inclusión in Science Frontiers, craters must be hundreds of miles wide or be of suspicious provenance.

Other kinds of quaiifying "negative" topography inelude seafloor pock-marks and deep lake basins with.unusual properties. Altogether, we list here seven categories of potentially anomalous phenomena. (See vol. 1 for still others.)

•The Tunquska Event. What really caused it. Why is there no cráter?

•The Chicxulub Cráter. Was it really the cause of the dinosaur's demise?

•Debatable cráter chains. Are some simply gas-explosion structures?

•Recent eniqmatic craters and qround disturbances. The nature of the supposed impactors is unknown. There are a surprising number of these!

•Seafloor craters and pockmarks.. Do smali methane "burps" cause ships to founder, and did giant ones alter ancient climates?

•Unusual lake basins. Vostok (Antárctica) and Baikal (Siberia).

•The missinq Australite source cráter. The source of the enormous tektite strewn field is still uncertain.

THE TUNGUSKA EVENT

REMNANTS OF TUNGUSKA

When something exploded over Siberia on June 30, 1908, flatterúng more than 2,100 square kilometers of forest, it left no cráter of consequence and no obvious pieces of itself. Scientists have claimed all along that it was a comet or asteroid that detonated in the atmosphere. A few less conservative people ventured that it was an alien spaceship that blew up!

G. Longo and colleagues, Universita di Bologna, have apparently found a way to determine the true nature of this in- vading object. They examíned the resin in the conifera surrounding the site of the blast to see if any particulate debris had been trapped in the sticky goo— much as ancient inseets have been pre- served in amber.

Longo and associates used a scanning electrón microscope to examine 7,163 particles recovered from the site and from two control sites. They found anomalously high abundanees of ele-menta such as iron, calcium, aluminum, copper, gold, zinc, and oxygen in the Tunguska-site samples, strongly peaking around 1908.

Their conclusión: The impactor was a stony meteorite of normal density. (Anonymous; "Remnants of Tunguska," Astronomy, 23:26, October 1995)

TUNGUSKA AND MIRROR MATTER

Mirror matter is another new candidate as Tunguska's cause. This and other radical hypotheses, like the methane blowouts mentioned above, cannot be re- jected perfunctorily because, even after 75 years and 35 expeditions to the mosquito-dominated Tunguska site, scientists have not uncovered any con- vincing evidence that a comet, meteorite, or asteroid was the culprit.

R. Foot, University of Melbourne, has pointed out that, although mirror matter is widely believed to interact with normal matter only through gravitation, recent experiments suggest that rairror- matter electrons and protons may earry miniscule electric charges—just enough to cause a mirror-matter projectile to explode at a high altitude thereby crea- ting the havoc observed in the normal matter exposed below at the Tunguska site.

Of more than passing ínterest is the possibility that thousands of tons of mirror matter may permeate the Tunguska terrain to great depths----------none of it detectable by any of our modern in-strumentation.

(Chown, Marcus; "What Lies Beneath?" New Scientist, p. 17, July 28, 2001)

TUNGUSKA: AN INSEDE JOB?

Virtually all speculation about the 1908 Tunguska Event assumes an external cause: a meteor, a comet, an asteroid, or even the accidental explosión of an alíen spaceship. A recent meeting of Tunguska experts in Russia looked down rather than up for Tunguska's initiating phenomenon.

In this open-minded review, two little-publicized but highly pertinent Tunguska observations were discussed.

(1) The catastrophe had five centers of destruction rather than one.

(2) At the Tunguska site are many large root stumps, not yet rotted away, that cannot be linked to any pits associ- ated with their origin. These stumps were apparently blown out of the ground and hurled dozens of meters from where they stood prior to the Event.

Next to be considered were the unap-preciated similarities between the Tunguska Event and the 1883 explosión of Kraka- toa.

The four bright nights in Europe and western Asia, straddling 30 June 1908, are remimiscent of the 1883 Krakatoa outburst, they ask for transient scatterers in the upper atmosphere, above 500 km, at heights which only methane and hydrogen are light enough to reach in sufflcient quantity. Fast-rising natural gas has been re- peatedly detected in recent years, in the form of "mystery elouds"------by airplane pilots----and indirectly as pockmarks on 6% of the sea floor.

In other words, Tunguska might well have been----not an extraterrestrial im-pact----but a simultaneous outburst and detonation of natural gas from five closely spaced vents.

The report continúes with pro-and- con discussions, concluding that this outrageous hypothesis cannot be dismis sed!

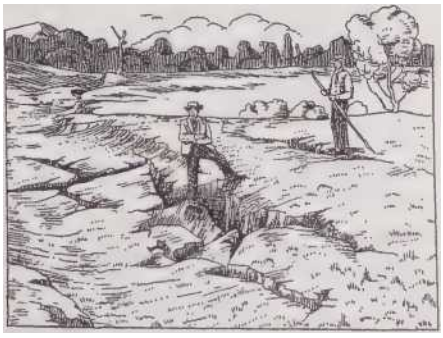
(Kundt, Wolfgang; "Tunguska 2001," Meteorite, 7:25, November 2001)

TUNGUSKA CONFUSION

Will we ever know what really happened in Siberia on June 30, 1908? It has long been held that the Tunguska Event was an extraterrestrial impact of some sort. But, more reeently (above), the Siberian devastation has been blamed upon a stupendous explosión of natural gas.

The major faets supporting an internal rather than external causative agent are: (1) There were five centers of destruction; and (2) The presence of many huge root stumps that were blown out of the ground, mostly likely by some sub- terranean forcé.

The above was printed a year ago. Two more ítems have now appeared in the literature that support the gas- explosion theory. These reporta add two



Results of a spontaneous explosión of natural gas at Waldron, Indiana, on August 11, 1890. Flames shot 300 feet into the air. Such explosión structures could account for so me "negative" topo- graphy mentioned in this section.

more supportive facts: (1) Trees were left standing in the middle of supposed ground-zero where one would anticípate the greatest devastation; (2)'No particu- late matter typieal of extraterrestial impacts has ever been found.

(Holden, Constance, ed.; "More Theories on Tunguska," Science, 297:1803, 2002. Jones, Nicola; "Did Blast from Below Destroy Tunguska?[11] New.Scientist, p. 14, September 7, 2002)

The no-particulate-matter claim has been challenged by S. Dunlop. He asserts that minerologist O.A. Kirova has found magnetite and silicate globules typieal of meteoroids in samples from a 1958 expedi- tion to Tunguska. Further, a 1962 ex- pedition was dispatched to determine the distribution of these extraterrestrial particles. They were found in a fairly well-defined ellipse, with the highest concentrations between 100 and 200 kilo- meters north-northwest of the epicenter!

(Dunlop, Storm; "Globules at Tunguska," New Scientist, p. 28, October 5, 2002)

Case closed? In N. Jones[1] article (refe- renced above), it is noted but otherwise avoided that the concentration of carbon- 14 at the Tunguska epicenter is so high that radiometric dating places the Tunguska Event in the future!

Comment ■ We would be remiss if we failed to mention the claim that a nuclear radi- ation catastrophe circa 12,500 years ago reset the radiometric docks in North America such that archeological arti- faets are 10,000 years too young. (See **pp. 55-56.)**

THE CHICXULUB CRATER

THE KTB BOMBARDMENT

Both the media and the scientific com- munity have a flxation on the Yucatán cráter Chicxulub as the cause of the KTB (Cretaceous-Tertiary Boundary) catastrophism. Actually, this period of terrestrial mayhem may have had múltiple causes. The recent discovery of "Silver- pit,"a multi-ring cráter, 2-20 kilometers wide, on the floor of the North Sea, is the thirteenth impact cráter associated timewise with the 65-million-year-old KTB. Only one of the thirteen is in North America: the Manson cráter in Iowa.

These thirteen KTB craters have a global distribution, not the hemispherical pattern expected if they were due to the breakup of an asteroid on a coUision course with earth. Rather:

> The clear implication of this global cratering [temporal] cluster is the explosión of a planet-sized parent body elsewhere in the solar system.

(Van Flandern, Tom; "13th Impact Cráter Associated with the K/T Boundary," Meta Research Bulletin, 11:61, 2002)

Comment. The eruption of the massive Deccan flood basalts in India have also been linked time-wise to the KTB catastrophism .

CHICXULUB DIDN'T DO IT!

Given its media coverage, just about everyone now believes that a giant impact about 65 million years ago wiped out the dinosaurs and assorted other life-forms, The impactor's damage can be seen seismically about 1500 meters beneath Mexieo's Yucatán Península. There, geophysicists discern a huge fos- sil cráter named Chicxulub. When it
was blasted out----it purportedly formed the so-called KT Boundary (for Cretaceous-Tertiary)----------a time of great global catastrophism.

But a few brave souls, mainly paleon- tologists, doubt that Chicxulub was the solé culprit. There actually may have been múltiple, simultaneous impactors. Then, there were those great volcanic outpourings about 65 million years ago that spread lava out over huge areas, now to be seen as the immense lava flows of India's Deccan Traps and the Siberian Traps. In fact, Chicxulub may not have blitzed the dinosaurs at all!

What better way to prove the validity of the Chicxulub hypothesis than to drill down 1500 meters and extract core samples from the buried cráter? This has been done. At least one analysis of the cores is distinctly unfavorable to the Chicxulub hypothesis.

G. Keller, a Princeton paleontologist and authority on fossilized marine plank- ton called "foraminifera," is now a Chicxulub doubter. You see, the KT catastrophism, supposedly initiated by Chicxulub, wiped out much of the foraminifera. This is evident in the fossil record of the KT Boundary. However, Keller's analysis of the Chicxulub drill core shows that foraminifera prospered for 300,000 years after the Chicxulub impactor made its huge cráter and debris layers.

Of course, Keller's findings are chal- lenged, but some of the challenges are perhaps suspect. N. MacLeod, a paleon- tologist as London's Natural History Mus- eum, remarks:

> It's not about Science.. .It's about people's reputations.

(Dalton, Rex; " Hot Tempere, Hard Core," Nature, 425:13, 2003)

Reference. For additional Chicxulub doubts, see Courtillot, Vincent; Evolu- tionary Catastrophes, Cambridge, 2003.

THE SHRINKING OF CHICXULUB

Above, we learned that the paleontologi- cal information derived from drill cores pulled from the environs of Chicxulub cráter beneath the Yucatán Península cast doubt on the still-accepted theory that the impact that made this cráter created the K/T (Cretaceous-Tertiary) boundary and the subsequent havoc that led to the termination of the dinosaurs.

We now discover that the Chicxulub event was in any case not robust enough for the task.

> Drilling results seem to negate ear- lier estimates of both cráter size and the sequence of deposits of impact ejecta in various localities in México. This is also contradictory to the Chicxulub impactor having been the main killer at the K/T boundary. Original estimates from satellite imagery and sound waves seemed to indícate a cráter with a diameter 180 km and depth 10 km—big enough to produce' a mass extinction event. But closer examinations with on-site drilling re- vealed a smaller cráter, 100 km diameter at most with layers hundreds of meters deep. This would have been insufficient to produce catastrophic World-wide effeets. This merely complemente our earlier notes about the large number of impact craters global- ly associated with the K/T boundary event at 65 Mya.

T. Van Flandern, the author of the above quote asserts that the K/T data at hand are best explained by the exploded-planet hypothesis.

(Van Flandern, Tom; "Chicxulub Cráter 'Shrinks', Now Too Small to Have Caused Mass Extinctions," Meta Research Bulletin, 12:47, no. 3, 2003)

DEBATABLE CRATER CHAINS

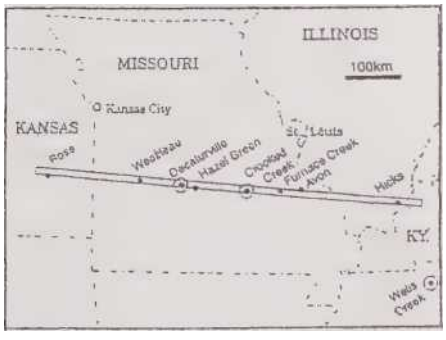
EIGHT LITTLE CRATERS ALL IN A ROW

The reeent impact upon Júpiter of a pro- cession of chunks from Comet Shoemaker- T.evy 9 has encouraged geologists to. look for cráter chains here on earth. Such have been spotted on the moon, and it is unlikely the earth escaped such bar- rages. Of course, older terrestrial cra- ters are harder to identify due to the ceaseless geological activity here on earth.

In the first 1996 number of Geophysi- cal Research Letters, M.R. Rampino and T. Volk describe a possible swath of meteoric devastation across the North American Midwest.

> Eight circular geologic structures ranging from 3 to 17 km in dia- raeter, showing evidence of outward- directed deformation and intensive brecciation, lie within a linear swath stretching ~700 km across the United States from Southern Illinois through ' Missouri to eastern Kansas. Based on their similar geological characteristics and the presence of diagnostic and/or probable evidence of shock, these structures, once classified as 'crypto- volcanic' or 'cryptoexplosion' structures, are more confidently ascribed to hypervelocity impact. No other similar occurrence of aligned features is known, and we calcúlate the proba- bilíty of a chance alignment to be $< 10^{-9}$.

The craters are all roughly the same age: 310-330 million years. Rampino and Volk suspect they were formed all at once by a string of asteroide or comets.



Linear chain of known and possible crater- like structures stretching across the North American Midwest. Some may not be impact- caused.

(Rampino, Michael R., and Volk, Tyler; "Múltiple Impact Event in the Paleozoic: Colüsion with a String of Comets or Asteroide?" Geophysical Research Letters, 23:49, 1996)

Comments. Grave doubts have been expressed about this cráter chain by other scientists, mainly because of age differences.

We catalog another possible chain of meteorite scars in Argentina, near Rio Cuarto, in vol. 1, p. 199.

IMPACT CRATERS: THE PARTY LINE REVISED AND RE-REVISED

100 years ago. BacK in 1900, a geologist risked his reputation by suggesting that Arizona's Meteor Cráter was an impact structure. It had to be volcanic or per- haps due to a steam explosión!

50 years ago. In 1950, a geologist risked his reputation by suggesting that large impact structures existed; that is, big- ger than 10 kilometers in diameter.

0 years ago. Today, geologists converse blithely about 100-kilometer structures buried beneath the Yucatán and Chesa- peake Bay. They are, however, exceed- ingly chary about long chains of impact structures.

Those eight craters in a row. Geologists are questioning whether the eight structures stretching from Kentucky to Kansas (mentioned just above) are aü impact- caused. In a letter to Astronomy. A. Goldstein asserts that only three are impact craters; the other five are cryptoexplosion structures; that is, due to internal activity of some sort. However, Goldstein adds that there are actually three additional structures on this long line in Kentucky.

(Goldstein, Alan; "Múltiple Strike Stric- ken," Astronomy, 24:20, July 1996)

Comment. Even if eight of the eleven structures on the line are cryptoexplo- sive in origin, one has to wonder why these are all lined up. A long line of weakness in the crust? .

Meanwhile, in Africa. 1994 radar images from the Space Shuttle have revealed a chain of three suspicious circular structures in the Sahara of northern Chad. Largely buried in sand, each is about 12 kilometers in diameter. Only one of these structures has been studied at ground level; and it is of impact origin, as confirmed by upturned strata and grains of shocked quartz. The other two could be volcanic say the skeptics. It wiE take an expedition to Chad to clarify things.

(Kerr, Richard A.; "Impact Craters All in a Row?" Science, 272:33, 1996)

A final comment—at last! All impact- crater chains are relevant to the claim of H.R. Shaw that even the earth's largest impact structures are found in swathes (chains). In his wonderfullv heretical book Craters, Cosmos, and Chronicles: A New Theory of the E~árth, Shaw mentions several such swathes.
One of his chains ineludes Cliicxulub (beneath Yucatán), Manson (Iowa), Avak (Alaska), and three more in Russia. These are giant craters stretched out over much of the planet, not pipsqueak craters athwart a couple States!

50 years from now. In 2050, perhaps someone will wonder why Shaw's visión was rejected so emphatically today.

RECENT ENIGMATIC CRATERS AND GROUND DISTURBANCES

STRANGE EXPLOSIONS AT SASOVO, IN RUSSIA

Some most peculiar phenomena have oc- curred recently about 200 miles south- east of Moscow. Discussioms have ap- peared in Russian publications, but we have not yet seen anything in the Eng- lish- language journals. These phenomena have a bearing on the still-enigmatic Tunguska event of 1908-----customarily attributed to a celestial projectile of some sort----and perhaps even those bizarre "cookie-cutter" holes found in the U.S., Cañada, Norway, and else- where. One of our Russian correspo- dents has summarized what is known about the Sasovo explosions, and we are pleased to be able to present part of his (lightly edited) letter here:

> On April 12, 1991, a strange explosión took place near the Russian town of Sasova (350 km to the south- east of Moscow). After the explosión, a cráter, diameter about 30 m and depth 3 m, was found. At first, several ideas about its nature were pro- posed, but now almost all of then are abandoned, except one: that it was a tectonic (endogenic, to be ex- act) origin. This is proved by geo- physical research in the región and a secondary, weaker explosión (a cráter also appeared) taking place in 1992 in a sparsely populated area about 9 km away from the first one. For some years Defore the explosions, there were signs of increased tectonic activity in the región: a great number of 'fireballs' and so-called UFOs, evidence of slow grouna deformation, and so on. For about several hours before the 1991 explosión, in many places, people saw numerous 'fireballs,' often accompanied by rumbling and even ground vibrations. In many houses, animáis began to be anxious. Some people felt Ül. Railroad communi- cation devices failed. About 1 minute before the explosión, noise appeared in broadeast radio receivers, this soon jammed all radio statíons. At a distance of up to several hundred kilometers from the epicenter, some people said that they felt a "heat wave" and suffocation. Near the epicenter, a bright flash with a dura- tion of several seconds uud an explosión (thunder and ground shock) took place. (According to some re- ports. at first a 'glowing object' flew down to the ground.) Probably liglit phenomena were present at some other places. ■
>
> The 1991 Sasovo explosión was accompanied by a number of intri- guing phenomena, sometimes resem- bling (ball) lightning and even tornado damage. There was some unusual and selective damage in the town and even in the village 20 km from the epicenter. Azimuth distribution of hurled frozen soil from the cráter and damage had four lobes. But, on the other hand, a tree 10 m from the epicenter was undamaged. There was no damage on the ground level at a distance up to about 1 km from the cráter (only ground swing and jerk- ing), but several high suspended electric wires were torn off. At large

distances, there was unusual damage at the ground level, and even water pipes at a distance up to 15 km from the epicenter were torn off. During the explosión, in closed and undam- aged rooms, in most cases different things flew with soft landings, and even some people were transported by a unknown forcé, Hollow plástic toys and electric lamp bulbs exploded. Inner Windows were smashed while outer ones were undamaged. At a distance of about 10 km from the main cráter, two more pits in the ground appeared simultaneously with the main cráter. Soil was hurled, and there were light phenomena.

(Ol'khovatov, A. Yu.; personal communication, March 1994. Russian references cited by Ol'khovatov were: Izvestiya, p. 8, November 17, 1993; and Izv. AN USSR Earth Phys, 27:606, 1991.)

A TUNGOSKA-LIKE BLAST IN BRAZIL IN 1930

In a review of D. Steel's new book Rogue Asteroids and Doomsday Comets, C. Keay injects a startling bit of news:

> Too late for Duncan Steel to inelude before his book went to press, comes the latest news that British astrono- mer Mark Bailey and his colleagues have discovered that a Tunguska-like event in 1930 blasted fíat a huge ex- panse of jungle near £tn upper tribu- tary of the Amazon in Brazil cióse to the border with Perú. The resulting ñres burned for months. The only European near at hand was a Catholic priest, whose reports of the incident have lain unnoticed in the Vatican library until now.

(Keay, Colin; "The Non-Denominational Day of Reckoning," The Skeptic, 15:44, Spring 1995. This journal is published ín Australia and should not be confused with the UK journal of the same namej

TARGET: SOUTH AMERICA

August 13, 1930. Upper reaches of the Brazilian Amazon.

Above, we provide a short notice of a probable large bolide impact near Brazil's border with Perú. Apparently, this event resembled the much more famous 1908 Tunguska blast. More de- tails have now been provided by M.E. Bailey et al in the Observatory, as based on oíd accounts that appeared in the British Daily Herald and the papal newspaper L'Osservatore Romano. Bailey et al write:

> The Daily Herald report [March 6, 1931] describes the fall of "three great meteors... [which].. .fired and depopulated hundreds of miles of jun- gle... The fires eontinued uninterrup- ted for some months, depopulating a large area." Unfortunately, although the fall is said to have occurred around "8 o'clock in the morning" and to have been preceded by re- markable atmospheric disturbances (a "blood-red" Sun, an ear-piercing "whistling" sound, and the fall of fine ash which covered trees and veg- etation with a blanket of white), few details are provided that constrain the time and place of the event. Nevertheless, the story refera to an article in the papal newspaper L'Os- servatore Romano [March 1, 1931], apparently written by a Catholic mis- sionary "Father Fidelio, of Aviano", and it is to this that we now turn.

Apparently, there were three bolides or fireballs seen. Father Fidelio wrote:

> They landed in the centre of the forest with a triple shock similar to the rumble of thunder and the splash of lightning. There were three dis- tinct explosions, each stronger than the other, causing earth tremors like those of an earthquake. A very light rain of ash eontinued to fall for a few hours and the sun remained veiled till midday. The explosions of the bodies were heard hundreds of kilometres away. (Ref.l)

M.E. Bailey singles out two puzzling features of the Brazilian event: (1) the fall of dust before the fireballs were observed; and (2) the lack of any men- tion of a blast wave. Further, the L'Osservatore Romano account does not say anything about extensive forest fires. (Ref. 1; see Ref. 2 for a synopsis.)

Circa December 11, 1935. British Guiana (now Guyana).

Only five years after the just-mentioned Brazilian event, a large bolide apparently smashed into the jungle of Guyana. Buried in the library stacks, we found a mostly forgotten trio of reports on the 1935 event in a 1939 issue of The Sky, predecessor of Sky & Telescope. The articles suggest that the devastated area "may equal or exceed that of the great Siberian meteor of 1908." The bolide and apparent impact area were observed by a gold prospector, a Dr. G. Davidson. Davidson testified:

> About 10:30 in the morning we climbed to the top of the mountain in order to get a panorama of the surrounding country. We could see some areas that had been swept down by some great forcé, trees twisted off some 25 feet above the ground.
> We tried to enter one of these areas but the bush was in such a tangle that we had to give it up. (Ref. 3)

Photographs accompanying the articles confirm some of the devastation.

1995. Northeastern Brazil.

> Scientists in Brazil's northeastern state of Piaui are baffled by a cráter that was punched into the tropical rain forest shortly after witnesses reported seeing a bright light streak across the sky. Researchers are un- certain whether the cráter, 16 feet wide and 32 feet deep, was left by a meteorite or a piece of a comet. Physicist Paulo Frota of the Univer- sity of Piaui believes it was caused by a block of ice from a comet be- cause the surrounding vegetation is not burned and the cráter's rim is not raised. (Ref. 4)

(Ref. 1. Bailey, Mark F.., et al; "The 1930 August 13 'Brazilian Tunguska' Event," Observatory, 115:250, 1995. Ref, 2. Chown, Mar cus; "Did Falling Comet Cause Rumble in the Jungle?" New Scientist, p. 12, November 11, 1995, Ref. 3. Kroff, Serge A., et al; "Tornado or Meteor Crash?" The Sky, 3:8, September 1939. Ref. 4. Anony- mous; "Cráter Mystery," Anchorage Daily News, October 1, 1995. Cr. J. & L. Nicholson via L. Farish.)

A METEOR IMPACT OR EARTH SLUMP?

November 22, 1996. The Honduras-Guate- mala border.

About 10:10 PM, the residents of this area observed a red-and-yellow fireball moving east-to-west. The bolide's pas- sing was marked by a loud detonation. From this information, one would bet heavily that this was simply a routine meteor detonation caused by the heat generated during entry into the atmo- sphere.

The next morning, however, people discovered a landslide covering several acres on the slopes of Cerro Negro, a mountain 14 kilometers from San Luis. Did the meteor slam into the mountain overnight? So far, investigators have not been able to decide whether the landslide is just gravity-slumping on the slope or a disturbance created by the night's meteor. One observer believes he can see traces of a cráter some 50 meters wide. Experta from the U.S. and Cañada plan to examine the site in detail.

(Anonymous; "A Hit in Honduras?" Sky and Telescope, 93:12, March 1997)

A BRIGHT FLYING OBJECT AND ANOTHER ENIGMATIC CRATER

The curious event described in the fol- lowing abstract is eerily like the fireball and suspicious "cráter" mentioned above». In that incident, which occurred November 22, 1996, near the Honduras- Guatemala border, there was also a detonation .

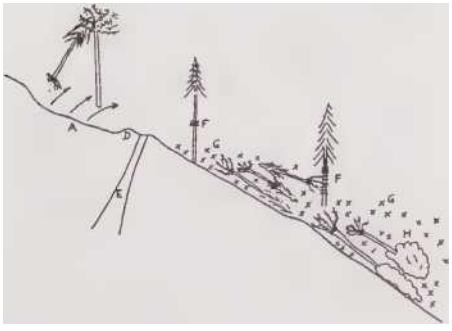
January 18, 1994. Santiago de Compos- tela, Spain.

> On the early morning of 1994 January 18, a very bright luminous object crossed the sky of Santiago de Com- postela, Spain. From visual sightings, it is concluded that the object wasn't a meteoric fireball (bolide). A surface "cráter" in Cando (cióse to Santiago) with dimensions 29 x 13 m and 1.5 m deep was later discovered within 1 km of the projected "impact" point of the luminous object. At this site, in addi- tion to the topsoil, full-grown pine trees greater than 20 m high were thrown downhill over a nearby road, leaving the downslope edge of the "cráter" untouched and with a steep interior waU (this would not be the case if a regular landslide were re- sponsible for the transport). Standing trees below the "cráter" showed em- bedded soil and plant residues up to heights greater than 3 m. No strange materials (raeteorites or artifaets)....

were recovered in or cióse to the "cráter"; all materials belonged to the site and were not shocked; thus an impact is very improbable.

A possible explanation capable of reconciling all of the observations is presented. It hypothesizes an erup- tion of earth gases to create the cráter, with the rising gas plume then interacting with atmospheric electri- city to produce the propagating fire- ball that was observed.

(Docobo, J.A., et al; "Investigation of a Bright Flying Object over Northwest Spain, 1994 January 18," Meteoritics and Planetary Science, 33:57, 1998)



(A) The shallow Spanish "cráter." (D)- "Cráter" lip ■ (E) Walkway. (F) Trees plastered with soil. (G) Soil thrown from "cráter." (H) Trees 0.6-meter (2-feet) in diameter thrown down the slope.

Comments. We cannot resist associating these strange "craters" with the even stranger "cookie-cutter" holes or shallow "craters" reported in vol. 1, p. 198, and in more detail in ETB7 in our cata- log Carolina Bays, Mima Mounds, etc.

In a bizarre coincidence, the fireball's "suspicious cráter" mentioned in the first paragraph is immediately preceded by a suggestion by R. Spaulding that TWA800 was downed by a methane erup- tion from the sea which ignited, thereby leading to the several observations of streaks of light prior to that disaster. And who is the second-listed author of the paper abstracted above? None other than R. Spaulding!!

SOMETHING WENT "SPLAT" IN BOLIVIA

The Iturralde Cráter in western Solivia is a shallow, marshy depression about 5 miles wide. Satellite pilotos first revealed a neat circlular difference in the jungle vegetation back in the 1980s. But the región is difficult to access and rife with snakes, malarial mosquitoes, and, most annoying of all, hordes of sweat bees.

Nevertheless, an expedition finally made it to Iturralde in 1998. They found a low, boggy depression, a central up- lifted area. and a rim 6-7 feet higher than the floor of the circle. The geo- graphy and other signs are consistent with the impact of a meteor that went "splat" in soft, deep sedimente. The 1998 investigators postulated a blast equivalent to 1,000 megatons of TNT.

This would have been powerful enough to cause some climatary havoc but no mass extinction of earth life. All signs at present point to Iturralde being only about 10,000 years oíd.

NASA has has recently dispatched a new expedition to Bolivia to learn more deíails.

(Roylance, Frank D.; "In a Jungle's Depths, a Quest for Answers," Baltimore Sun, September 14, 2002.)

Comment. The 10,000 B.P. figure should set archeologieal alarm bells aringing. Many avant garde, non-establishment archeologists are convinced that about 10,0 years ago an early, advaneed civilization—the Osirian or Golden Age —was snuffed out by some sort of world-wide catastrophe.

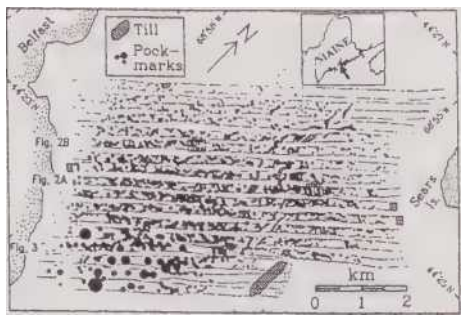
SEAFLOOR CRATERS AND POCKMARKS

GLANT SEA-BED POCKMARKS

[The following long, initially dull (?) discussion leads unerringly to the Ber- muda Triangle via a Fortean phenomenon!]

Unrecognized until just a few years ago (vol. 1, p. 197), sea-bed pockmarks are remarkable geological features. They occur worldwide on the floors of all of the oceans and even some lakes. They are found in shallow • waters and at depths of thousands of meters. In diameter, these roughly conical depressions may span 350 meters or more and be up to 35 meters deep. No trivial phenomenon, some pockmark fields exceed 1,000 km^2, Like the curious abyssal ridges (p. 186), sea-bed pockmarks are rarely discussed despite their great geological and eco- nomic importance.

Recent issues of Geology contain three fascinating papers relating to giant sea-bed pockmarks. In Ref. 1, J.T. Kelley et al describe a pockmark field in Belfast Bay, Maine. Here, the density of the pockmarks reaches 160 per km^2, and they are apparently the largest pockmarks yet diseovered. The Belfast Bay field is "fresh" and "active" in the sense that the pockmarks are sharply defined and methane bubbles still stream up from buried organic mat- ter.

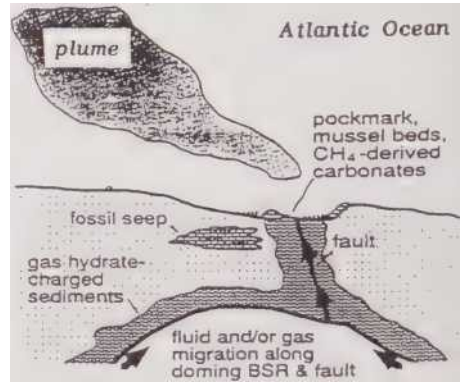


Map of the large, crowded field of sea- floor pockmarks in Belfast Bay, Maine.

Another pockmark field is the sub- ject of P.R. Vogt et al (Ref. 2). It occupies a strip about 1.3 km wide and 50 km long between Greenland and Spitzbergen. This strip of pockmarks seems to be underlain by a deposit of methane hydrate 200-300 meters thick. [Methane hydrate is a weird substance that looks like dirty ice. When brought to the surface, the methane fizzes away, leaving only a puddle of dirty water!]

Lastly, in Ref. 3, C.K. Paull et al report on the release of plumes of methane bubbles from the Carolina continental rise at a depth of 2167 meters. Here, the sediments are riddled with methane hydrate.

Why all this fuss over fizzy ice, and what is the connection between methane hydrate and pockmarks?



A plume of natural gas rising from the seafloor off the Carolina coast.

•The methane hydrate deposita re- present immense accumulations of methane —probably far more natural gas than geologists have found on the continents.

•Sea-bed pockmarks are thought to be formed when methane gas is explo- sively vented, perhaps when methane hydrate----very unstable stuff------sudden- ly decomposes.

•Offshore booms and mistpouffers (p. 259) are often heard in the areas where pockmarks are common.

•Rich clusters of methane-dependent life forms surround methane seeps.

•The quantity of buried organic mat- ter required to create all the offshore methane is staggering. Where did it all come from and how did it come to be buried at such great depths? Could some of the offshore methane be abiogenic?

•Could the explosive decomposition of methane hydrate create giant bubble plumes that might engulf ships (in eertain infamous "triangles") and cause them to sink like rocks in the low- density froth? (vol. 1, p. 208)

(Ref. 1. Kelley, Joseph T., et al; "Giant Sea-Bed Pockmarks: Evidence for Gas Escape from Belfast Bay, Maine," Geology, 22:59, 1994. Ref. 2. Vogt, Peter R., et al; "Methane-Generated (?) Pockmarks on Young, Thickly Sedimented Oceanic Crust in the Arctic: Vestnesa Ridge, Fram Strait," Geology, 22:255,

1994. Ref. 3. Paull, Charles K., et al; "Methane-Rich Plumes on the Carolina Continental Rise: Associatlon with Gas Hydrates," Geology, 23:89, 1995)

UNUSUAL LAKE BASINS

WITCHKS HOLE AND THE BERMDDA TRIAN GLE

Witehes Hole is a huge cráter on the floor of the North Sea. At its center lies a sunken ship. Witehes Hole is not a meteor cráter but rather the cráter left by a massive methane gas blowout. A reasonable question asks whether that ship in the center of the hole foundered
when a huge bubble of methane------a so-called "blowout"----enveloped it, or perhaps the vessel sank in the low-density froth of a myriad of small methane bubbles.

Some studies by D.A. May and J.J. Monaghan suggest that giant methane burps can indeed sink large ships. They write:

> When the radius of a large bubble is comparable to or greater than the length of a ship's hull, we found both experimentally and vía numerical simulations that it is possible for the bubble to cause the ship to sink. Sinking arises because a mound of water is raised above the región where the bubble reaches the surface. The flow from the mourid creates a deep trough on each side of the mound, and the flow from the mound can carry a boat into the trough.

(May, D.A., and Monaghan, J.J.; "Can a Single Bubble Sink a Ship?" American Journal of Physics, 71:842, 2003)

Comments ■ The danger of large methane releases on shipping due to loss of buoyaney was recognized at least a far back as 1982. (vol. 1, p. 208) Today, scien- tists are concerned that global releases of methane (a potent greenhouse gas) from the gigantic deposite of methane hydrate along many coastlines may have caused climate changes in the past and may do so again in the future.

We should not ignore the fact that large areas of the sea floor in the Ber- muda Trian gle are rich in methane hydrate! Not only are ocean vessels susceptible to methane burps but even air- craft flying through a major methane release might be adversely affected.

WARM LAKE FOUND UNDER ANTARCTIC ICE SHEET

Russian scientists using "ice radar" and artificial seismic waves have discovered a vast warm-water lake under their Ant- arctic base. Named after the Russian base, which is located 1,300 kilometers from the South Pole, Lake Vostok lies under 3,800 meters of solid ice and, apparently, directly under the base. This remarkable body of water was re- ported in the Journal Kyokuchi, pub- lished by the Japan Polar Research Association. The lake is 250 kilometers long, 40 wide, and 400 meters deep. Ob- viously, it requires some sort of expla- nation as to why is not frozen.

Two theories have been proposed: . (1) Heat from the earth's interior has kept it from freezing; (2) The lake has' not yet had time enough to freeze after a températe period that ended about
5,0 years ago.

(Anonymous; "Lake Discovered beneath Antarctic Ice," The Japan Times, May 23, 1995. Cr. N. Masuya)

Comment. Qm there be a connection between this discovery and the ice-free Antárctica suggested by C.H. Hapgood in his Maps of the Ancient Sea Kings? *4

ANTARCTICAS LAKE VOSTOK REVISITED

Based upon a Japanese account, we reported the discovery of Lake Vostok - above almost a year ago. Some details are finally appearing in Western science publications. We can now offer a good cross seetion of the lake, plus some thoughts about potential ecosystems ex- isting deep under the lake's ice.

Although Lake Vostok lies under some 4 kilometers of ice, it remains liquid as geothermal heat seeps up through its floor. Surprisingly, the thick ice cover does not preelude all contact with the surface above. The covering ice sheet moves slowly across the lake and, aB it does so, its bottom melts a bit, releasing frozen-in oxygen as well as life forms— still-living microorganisms and dead creatures that fell onto the Antarctic ice thousands of years ago. Thus, there is a perpetual source of food and new life.

Cores drilled from the ice sheet capping Lake Vostok have brought up a great diversity of live microbes that have survived despite the low tempera- tures and passage of time. A living unicellular alga was found 2,375 meters down in ice about 110,000 years oíd. Spore-forming bacteria brought up from 2,395 meters are about 200,000 years oíd and still alive! Although Science has proclaimed that Lake Vostok biology must consist entirely of microorganisms, no one really knows what is down there.

Another fascinating fact is that some 70 other subglacial bodies of fresh water have been found under the central Antarctic ice sheet. Lake Vostok is only part of a "vast hydrological system."

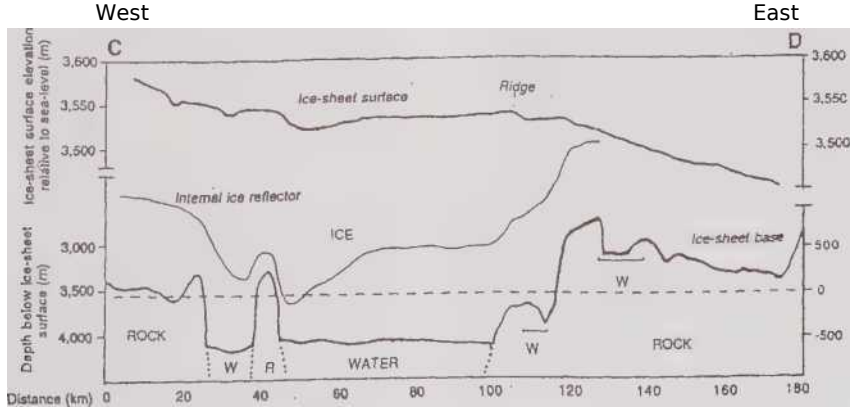
(Kapitsa, A.P.; "A Large Deep Fresh- water Lake beneath the lee of Central East Antárctica," Nature, 381:684, 1996. Monastersky, R.; "Giant Lake Hides beneath Antarctica's Ice," Science News, 149:407, 1996)

Comment. Antarctica's "vast hydrological system" could be linked to a global crevicular system of fluid-flUed, life-sustaining cracks, fissures, and porous rocks.

BAIKAL: THE INLAND OCEAN

Lake Baikal, in Siberia, is the planet's deepest lake (1635 meters) and the richest in biodiversity (over 1,000 species of animáis and plants existing nowhere else). Even though Lake Baikal is only 20-25 million years oíd, more than 5 kilometers of sediment have accumulated in some spots. These faets are remarkable as fresh-water lakes go, but Baikal also has features usually found only in salty oceans. It seáis sport in fresh water 1,000 kilometers from the nearest salt water. (How did they get there?) Even more interesting are Baikal's thermal vents or chimneys that are otherwise restricted to cracks in the earth's crust in the deep oceans.

Further enhancing Baikal's marine attributes, deep drilling and seismic profiles have recently discovered the existence of gas hydrates (methane hy-



Cross seetion of Lake Vostok in Antárctica, as determined by seismologists.

drate, for example). Plumes oi gas bubbles have also been detected where gas hydrates have been tectonically disturbed. There are even cráters on Bai- kal's deep bottom where gas hydrates have erupted explosively.

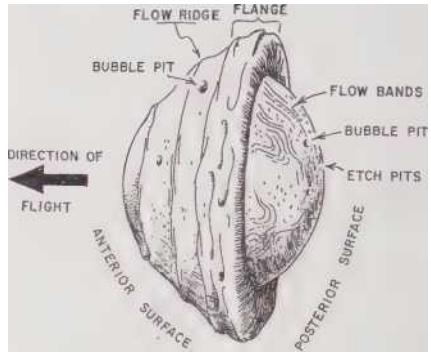
(De Batist, Marc, et al; "Tectonically Induced Gas-Hydrate Destabilization and Gas Venting in Lake Baikal, Siberia," Eos, 80:F502, 1999)

Comments. Baikal's gas-explosion craters resemble those on the floor of the North Sea. There, the sudden releases of gases are thought to cause the famous "mist-pouffers" or "fog-guns" heard around the shores of the North Sea. The Barisal Guns (India) and Guns of the Seneca (New York State) probably have similar origins. (GSD1 in Barthquakes, Tides..) Someone should be listening for "Baikal Guns."

(Paine, Michael; "Source of the Australasian Tektites," Meteorite, p. 24, Febru- ary 2001. Varricchio, Louis; "Tektite Origins," Meteorite, p. 4, May 2001)

Comment. Was the Australasian-tektite event an encounter with mirror matter, perhaps like Tunguska might have been?

We would be derelict not to mention here the claim by J.A. O'Keefe and others that the rain of Australasian tektites originated in an impact event that occurred not on the earth but rather on the moon. A lunar impact would obvious- ly not require a terrestrial cráter, and earthly biota would be Bpared. The debate over the possible lunar origin of this tektite fall has been particularly bitter. Those interested should refer to: O'Keefe, John A.; "The Corning Revolu- tion in Planetology," Eos, 66:89, 1985.



Button-type of Australite. A type of tektite.

CREVICULAR STRUCTURE

THE M1SSING AUSTRAUTE
SOURCE CRATER

THE STEALTH CATASTROPHE

Recently, as geologists reekon time—only 800,000 years ago----Australia, Southeast Asia, and the eastern Indian Ocean were bombarded by untold num- bers of small, oddly shaped stones called "tektites." New finds of tektites have expanded the strewn field of these Australasian tektites to inelude part of China. It now appears that about 30% of the earth's area was subjected to this stony bombardment. It is inescapable that the Australasian-tektite fall was a major event in the earth's history. But where are other signs of this great catastrophe?

The present consensúe holds that the Australasian tektites originated when a large celestial body slammed into our planet somewhere in Southeast Asia. The energy of the impact splashed droplets of molten rock into the atmosphere, where they were shaped aerodynamically and then fell as tektites. The extent of the immense Australasian-tektite strewn field implies a hard-to-miss cráter about 100 kilometers in diameter. Yet, despite the geological recency of the event and despite much geological surveying, no convincing cráter has been discovered.

So, in sum, we have abundant evidence of a terrestrial event encompassing much of the planet but no "smoking cráter"!

The mystery deepens when one realizes that whatever cataclysm sent the Australian tektites aloft may have been comparable in magnitude to the impact that extinguished the dinosaurs (and other fauna) some 65 million years ago. This much older event has its cráter buried below the Yucatán and is further marked by widespread biological extinc- tions. In contrast, the Australasian- tektite event is not only minus an ob- vious cráter but seems to have had scant effect on the earth's cargo of sensitive life forms. It was a strangely "gentle" event despite the rocky deluge of tek- títes. What really happened?

Historically, the earth's crust below about 10,000 feet has been con- sidered to be free of significant voids and crevices. Intense pressures were believed to cióse up any open spaces. This assumption is evidently false, because it has become more and more obvious from deep drilling and earthquake distribution that the earth's crust is deeply fractured and host to circulating fluids, some of which inelude life forms.

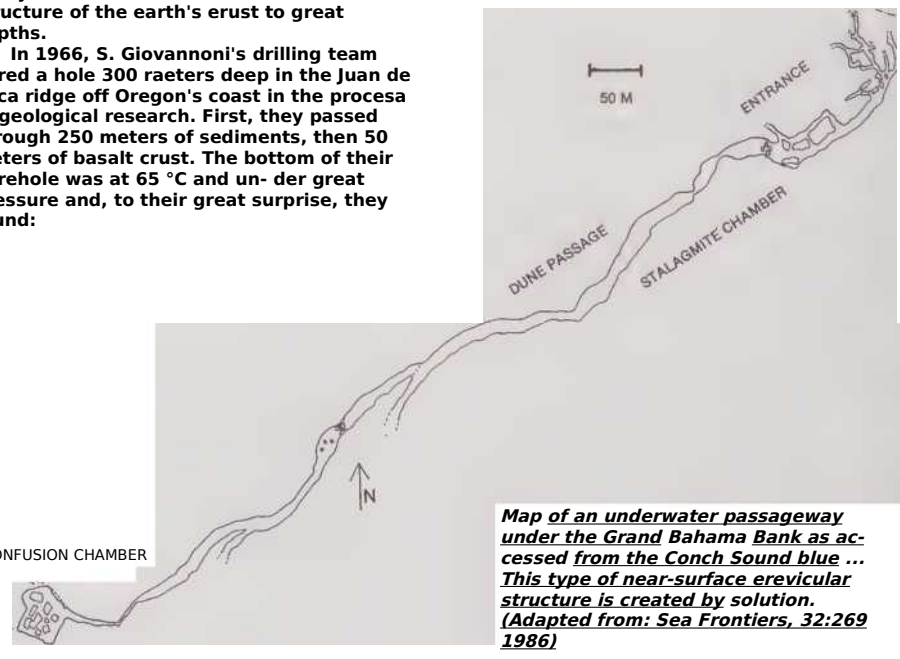
We use the term "erevicular structure" to identify this unexplored part of our planet.

SÜBTERRANEAN ECOSYSTEMS

It is well-accepted that each drop of sea water and fleck of garden soil contains millions of microorganisms, bacteria, and viruses. In addition and rather unexpectedly, it has been found that the ocean sediments rival the tropical rainforests and coral reefs in terms of biodiversity, What is less widely known is that a species-rich ecosystem also invades the erevicular structure of the earth's erust to great depths.

In 1966, S. Giovannoni's drilling team bored a hole 300 raeters deep in the Juan de Fuca ridge off Oregon's coast in the procesa of geological research. First, they passed through 250 meters of sediments, then 50 meters of basalt crust. The bottom of their borehole was at 65 °C and un- der great pressure and, to their great surprise, they found:

...a unique community of bacteria... a massive and virtually unknown ecosystem that runs independently of the Sun's energy. Almost every microbe found belongs to a completely new species.



Map of an underwater passageway under the Grand Bahama Bank as accessed from the Conch Sound blue ... This type of near-surface erevicular structure is created by solution. (Adapted from: Sea Frontiers, 32:269 1986)

The DNA of the of the newly found bacteria resembles that of the bacteria found at the hydrothermal vents that erupt from the sea floor but has nothing in common with other deep-sea bacteria.

Equally surprising was the discovery in the borehole of large quantities of long-chain organie molecules. The carbón isotopes in these chains reveal that they do not have a biological origin. Their source remains a mystery.

(Randerson, James; "Bugs Thrive under Seabed," New Scientist, p. 13, January 11, 2003)

Comment. Since sunlight is unnecessary to subterranean ecosystems, they could extend downward for miles.

SDRFACE LIFE (US!) ONLY A "SPECIAL CASE"

T. Gold is again challenging our most cherished ideas about geology and life's domain. In the subject article—-his latest paradigm-shaker-----he first re- views the abundant evidence for the existence of large quantities of primordial hydrocarbons deep within the earth and (probably) many other planets throughout the universe. Associated with these hydrocarbons is a "deep, hot, bio- sphere." By "deep", Gold means 100 kilo- meter s and more. It is this combination of a deep reservoir of hydrocarbons and life forms (probably mostly bacteria) that can account for (among other things):

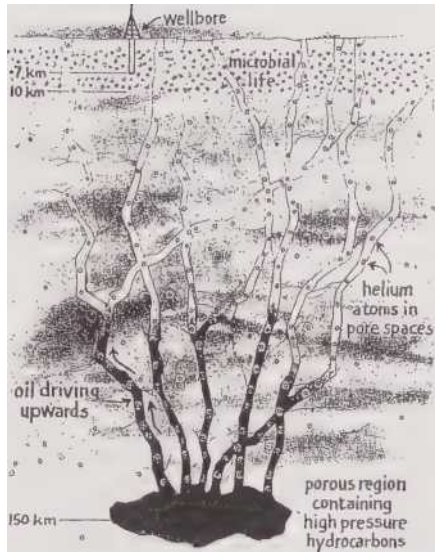
(1) The fact that all helium comes from oil and gas wells

(2)The fact that the composition of Petroleum is not what one would expect from the decomposition of plants and animáis. It is reaUy a mixture of primordial hydrocarbons with some added biochemical by-products; that is, producís of that "deep" biosphere.

Since carbonaceous material is now known to be common in the solar system (comets, carbonaceous chondrites, etc.), it is likely that many other planets also possess deep stores of hydrocarbons.
In these deep, warm, protected, energy- rich "wombs," complex biospheres might readily evolve. In Gold's view, deep biospheres may be the rule and surface life the exception!

Finally, Gold sees life as merely a natural process with no more meaning and purpose than accelerating the breaking of Chemical bonds and thereby increasing entropy!

> It has been said that nature abhors a vacuum, but nature doesn't care much for free energy either. All of biology is just a device for degrading energy from Chemical sources, and on the surface from the great tempera- ture differential between the hot sun and the coid of spaee. Perhaps biology is just a branch of thermo- dynamies, and there is no sudden beginning of life, but a gradual sys- tematic development toward more efficient ways of degrading energy. ...The Chemical energy available in- side a planetary body is then more likely to have been the first energy source and surface creatures—like elephants and tigers and people-------



Unrecognized forms of microbial Ufe may exist in deep crevicular structure many kilometers below the surface. Such microbes might be the source of the biological molecules found in the oil seeping upward into drilled wells, T. Gold holds that most of this deep oil was originally abiotic.

> which feed indirectly upon solar energy are just a specific adaptation of that life to the strangely favorable circumstances on the surface of our planet.

(Gold, Thomas; "An Unexplored Habitat for Life in the Universe," American Scientist, 85:408, 1997)

STRANGE RED SLIME IN MINE

In the 1960s, an abandoned mine in Wisconsin flooded with groundwater. Scuba di ver s could not resist the chal- lenge- As they explored the murky depths, they chanced upon deposite of spongy, red slime. When analyzed, the slime was found to contain the first naturally produced nanocrystals. Nano- crystals, like those described on p.
160, had previously been grown only in the lab. Also like the artificial nanocrystals, those in the red slime did not aggregate randomly; they "rotate into struetural accord with the adjacent partióles."

Whence the slime's 2-3 nanometer clumps of iron oxyhydroxide? Iron- oxidizing bacteria excreted them!

(Anonymous; "Strange Crystal Growth Found in Mine," Science News, 158:207, 2000)

Question. Was the red slime a biofilm?

TWO INNER-EARTH HERESIES

Deep water. In the long term, the earth's oceans are going to disappear. This prog- nostication is certainly counter to pre- sent global-warming expectations. The reasoning behind this radical future is a bit obscure.

It seems that the meteorites of the type believed to have aggregated to form the primitive earth contained about 2% water. But today's oceans make up only about 0.2% of the planet's mass. Where is that 99% of the water initially be- queathed the earth?

Of course, some of the déficit is in shallow aquifers and deeper crevicular structure. But K. Hirose, at the Tokyo Institute of Technology, maintains that at least five times the volume of the earth's surface water is locked up in the lower mantle 400-1,800 miles down. Tests of representative mantle rocks suggest that the mantle contains vast reservoirs of water---unobtainable by us but there nonetheless.

Unfortunately, as more of the great crustal plates are subducted into the mantle, as hypothesized by píate tec- tonics, they drag still more surface water with them down into the mantle. Hirose's Computer model predicts that in billion years the oceans will be sucked dry.

(Weinstock, Maia; "The Waters That Lie Within," Discover, 23:11, August 2002.)

Our planet is bleeding. Not blood, but oil and natural gas.' For example, satellite photos outline oil slicks many miles long where no oil wells have been drilled. The floor of the Gulf of México is widely cracked with "coid seeps." Contrary to popular thought, some oil fields believed depleted are now being refüled from below. This "new" oil is most likely very oíd oil created tens of millions of years ago.
It is a light oil, quite different from that originally pumped.

(Cooke, Robert; "Some Oil Fields May Be Getting Refilled from Deeper Reservoirs," Houston Chronicle, April 17, 2002. Cr. D.. Phelps)

MOUNDS, RIDGES, HILLS

Turning to "positive" topographical features----------as natural opposites of the "negative" craters and lake' basins—we find a wide spectrum of structures constructed or shaped by wind and water or possibly even ambitious animáis. In this volume we categorize seven types of such “positive" terrains.

•Mima Mounds and allied structures.

•Geothermal earth bulges.

•Mountains and seamounts. Anomalously aricient mountains, wave- planed seamounts (guyots), wide-area planation events.

•Sand and snow dunes. Moving dune fields, wide-area low-relief pat- terns best seen from aircraft, oddly shaped dunes.

•Patterned ground. Stone circles, polygonally fractured ground.

•Abyssal hills. A major but unappreciated terrestrial topographic feature.

•Flood debris. Giant terrestrial ripples, possible tsunami deposits.

MIMA MOUNDS AND ALLIED STRUCTURES

MOUNDS OF MYSTERY

Unlike many controversies in Science, the debates over the origin of the Mima Mounds have been friendly. No one gets overly passionate over bizarre heaps of earth; the Mima Mounds are "fun phenomena." Nevertheless, the biggest of them on the Mima Prairie, near Little Rock, Washington, are very impressive. They are closely-packed, some 6-8 feet high and about 30 feet across. It's kind of eerie walking amon," them; but they are also fun to ride over in vehicles—they create a sort of natural roller-coaster effect.

There are thousands upon thousarido of mounds on the Mima Prairie. Before farmers began leveling them, they stretched for more than 20 miles. If, as some have estimated, they are about 6,0 years oíd, they were originally twice as high before the elemente wore them down. The big question is and always has been: How were these large heaps of churned-up sand, fine gravel, and decayed vegetable matter formed?

One has to smile at the dominant theory: pocket gophers! Sure! pocket gophers are bundles of digging energy, but each Mima Mound contains about 100 tons of soil. Multiply that figure by the thousands of mounds, and you begin to wonder about the gopher theory. Also counting against the gophers is the fact that no one has ever found gophers in the mounds, ñor has a single gopher bone been found.

Now Mima Mounds are found in great numbers in many other locations in North America. (See map.) South America and Africa also have their "pimpled plains" as the early geologists called them. A. Berg has pointed out that Mima Mounds tend to be concentrated in seismically active areas, whereas pocket gophers and their kindred rodent exca- vators have a more general distribution. This observation has led Berg to theo- rize that earthquake vibrations rather than gophers raised the Mima Mounds. Indeed, if you sprinkle sand on a vibra- ting surface in the lab, you do see tiny mounds of sand rising mysteriously. (belo'w' and vol. 1, p. 201) Working against Berg's theory is the rather poor geographical match between the fields of Mima Mounds and areas of high seis-micity.

(Geiger, Beth; "Heaps of Confusión," Earth, 7:35, August 1998.)

Comments. Some thirty theories have been advanced to explain the Mima Mounds from ancient fish nests to the flooding due to giant tsunamis raised by asteroid impacts at sea.

DO EARTHQüAKES RAISE MIMA MOUNDS?

ThiB possibility was tendered in yol. 1, p. 201, in our notice of a paper in Geology by A.W. Berg. Berg had cover- ed a large Bheet of plywood with sandy soil and then vibrated the wooden sheet. The result: small mounds formed at points where intersecting vibrations cancelled each other out. Could the many fields of Mima mpunds in North America, Africa, and on other continente have been created in a like manner by earth- quakes?

The recent severe quake in India proved that the anBwer to the above question might be "yes." Some farm- lands that had been fíat were riven by cracks several inches wide and up to 70 feet deep and, in addition, topped by undulating mounds up to a foot high.

(Anonymous; "Farmers Work Land Churned by Earthquake," Spokane Re- view, October 10,1993. Cr. J. Satkoski)

Comment. Mima mounds are often higher than 1 foot, but at it certainly seems that Berg's experiment has been re- peated by Nature herself.

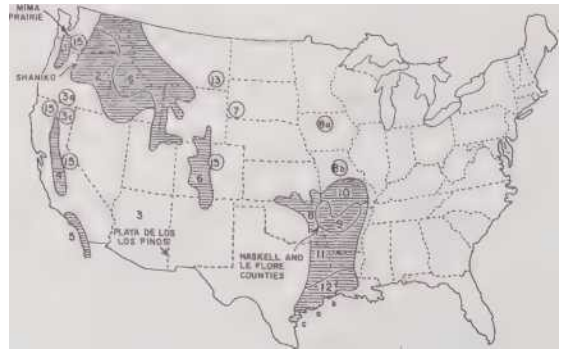
EARTHQÜAKES AND MIMA MOUNDS

In a recent paper in Nature, P.B. Umbanhower et al described how they created regular geometric patterns in a layer of fine partióles (only 0.15 mm in diameter) spread on a vibrating sur- face. At various forcing frequencies, they saw the layer of tiny brass spheres heap up into hexagonal honeycombs, circular piles, and even stranger shapes.

(Umbanhower, Paul B., et al; "Locajized Excitations in a Vertically Vibrated Granular Layer," Nature, 382: 793, 1996)

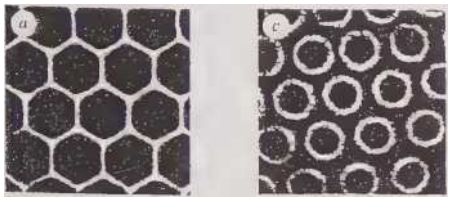
Comment. Nothing anomalous here, you say? Quite right, but perhaps there is in this experiment an explanation of a long-recognized geological anomaly: The origin of the famed Mima Mounds found scattered by the thousands in various regions of the planet, such as Mima Prairie near Puget Sound, in Washington State.

Actually, the demonstration of Umban-hower et al was preceded by a Bimilar



Distríbution of Mima Mounds and pimpled plains in the United States. The Mima Prairie is situated in Area #1.

experiment back in 1990. In that year, A.W. Berg reported in Geology how he had covered a piece of plywood with a thin layer of fine sand (loess) and sub- íected the plywood sheet to impacts sim- ulating earthquakes. Lo and behold, the sand rose up in an array of Mima Mound-like heaps. (See: vol. 1, p.
201.) Umbanhower, a physicist, probably doesn't read Geology, but the results of his team's experiments eertainly confirm Berg's simpler experiments and support the idea that quakes molded the Mima Mounds.



Patterns of tiny brass spheres created on a vibrating surface by different forcing frequencies. Were the Mima Mounds piled . in a similar^ fashion by earthquake■ vibrations?

GEOTHERMALEARTH BULGES

THE YELLOWSTONE-LAKE BÜLGE

Is Yellowstone Lake about to blow? Deep blue, with 110 miles of shoreline, and an average depth of 140 feet, this beau- tiful body of water covers an extensive fault system as Well an ominous bulge 100 feet high and 2,100 feet long. Pessi- mists claim the bulge is a precursor of a gigantic hydrothermal explosión that could have effects up to 600 miles away and darken the skies even farther. Then, there are optimista who see only a harm- less geological curiosity.

Park officials tell visitors not to panic. Yet, the entire park is increas- ingly restless geologically speaking. Steamboat geyser, tallest in the world, has spouted thriee already this year.
This is suspicious in light of its history of quieseent intervals up to 50 years long. One park trail has been shut down because the ground temperature rose to 200°F.

(Kelly, David; "Yellowstone Mystery Dome Fuels Fear, Fascination," Baltimore Sun, November 25, 2003)

MOUNTAINS AND SEAMOUNTS

THE ANOMALODS ANTIQUITY OF SOME LANDFORMS

All over the planet, but particularly in Australia, there exist great expanses of land surface that fossils and radiometric dating tell us are tens of millions of years oíd. This doesn't seem very seri- ous until we learn that, given today's erosión rates, these landforms should be deeply eroded or, more likely, com- pletely erased by the forces of nature.

This paradox has long been used by Creationists to challenge geological dating methods. Mainstream geologists do recognize the paradox but have had scant success in resolving it. For ex- ample, geologist C.H. Crickmay wrote;

> **Again, one finds all over the world, even high above and far distant from existing waterways, smooth-surfaced and level ground—including every- thing from small terraces to broad, fíat plains—much of it still bearing' intact a carpet of stream alluvium.**
> **Such lands were carved and earpeted, evidently, by running water, even though they are now in places where no stream could possibly run.. .What is remarkable about them is the per- fection with which they have out- lasted the attack of "denudation" for all the time that has passed since they lay at stream level. (The Work of the River, New York, 1974)**

This paradox of uneroded ancient landforms remains as obdurate as the landforms themselves.

(Oard, Michael J.; "Antiquity of Landforms: Objective Evidence That Dating Methods Are Wrong," CEN Technical Journal, 14:35, 2000. This Australian Crea- tionist journal asks many such pene- trating questions that we should not reflexively ignore.)

WHY ARE OLD MODNTAINS HIGH?

> **Many ancient mountain belts are still mountáinous. For instance, the last major orogenic activity in the Appa- lachians, Drals, and parts of Cañada and Australia was several hundred million years ago, yet these regions still have mountains and locally high relief (though not as imposing as the younger ranges of the Himalayas, Alps, or Rockies). Simple calculations imply that, at reasonable erosión rates, rivera alone should level this topogra- phy in a few tens of millions of years.**

Conventional attempts to answer the posed conundrum resort to: (1) continu- ing uplifting and crustal rebound; and (2) suggesting that the erosive power of rivers has been compromised by alluvium in their beds.

(Chin, Gilbert, ed.; "Why Are Oíd Mountains High?" Science, 299:1947, 2003)

Comments ■ The uneonventional answer to the above title's query is that geological dating may be in error—but we can't have that!

The foregoing quotation also mentions "locally high relief." Thus is brought on stage the question: Why are ancient ele- vated "plains" (not "mountains") not heavily scoured by erosión? There exist, especially in Australia, high plains that are tens of millions of years oíd and yet are scarcely touched by wind and rain. Not only are oíd mountains unleveled, but ancient, elevated, fíat plains have not been eroded significantly down the eons. See above and ETV10 in Carolina Bays, Mima Mounds,

WHAT CADSED A GLOBAL PLANATION EVENT?

In his review of the book The Origin of Mountains, edited by C. Ollier and C. Pain, M.J. Oard is struck by (as we all should be) by poorly understood global conditions prevailing in the Late Miocene/ Early Pliocene period (about 5 million years ago). During this time span, many areas on all continents were severely planed; that is, eroded to extreme flatness.

In this regard, Oard quotes from the book:

> **The remarkable thing is that plains of great perfection are ever made, despite all the obvious possibilities of complications. But they are real, and planation surfaces were widespread before the uplift of the many mountains of Plio-Pleistocene age.**

Oard then remarks that today's forces of erosión do not create those just- mentioned "plains of great perfection."
In fact, just the opposite prevails: a deeply scarred planetary surface is being carved by today's erosión.

Geologists perceive nothing so very special or different about the planet's climate in the Late Miocene and Early Pliocene. So, what happened to shave off the so many of the earth's irregularities? The book's editors admit:

> **At present, the cause of the observed high rate of planation remains a mys- tery.**

(Oard, Michael J.; "The Mountains Rose," TJ, 16:40, no. 3, 2002. TJ = Technical Journal.)

GÜILLOTINING THE SEAMOUNTS

Aecording to píate tectonics, new sea floor is formed at the mid-ocean ridges and spreads out toward the continents. Upon encountering the edges of the continents, the heavier sea-floor píate is subducted; that is, it dives under the lighter continental píate and sinks down into the mantle. Most of our planet's earthquakes origínate in these sub- duction zones. The so-called Ring of Fire fringing the Pacific ocean marks several active subduction zones.

The cause of the great quakes that shake the countries on the Pacific Rim has been elusive. M. Cloos and R.L. Shreve have recently proposed an easily-visualized quake-generating mech- anism: seamount decapitation. The sea floor edging toward the continents is really a conveyor belt loaded with sedi- ments and seamounts. The latter are no

molehiUs and often reach 4 kilometers above the conveyor belt. What happens when these massive peaks are sheared off by the sharp edges of the continents? Their decapitation is accompanied by a gigantic, drawn-out crunch, which we perceive as earthquakes. Since the sea-floor plates move only a few centimeters per year, the crunch can last for thou-sands of years. The decapitation of a 10-kilometer-wide seamount may generate a thousand magnitude-9 quakes. ' •

(Ruff, Larry J.; "Seamounts Make Earth-quakes," N ature, 381:371, 1996)

The guillotined slabs of sea-floor crust then "plunge" into the mantle, where they pile up in confused layers of dere- lict, continent-sized chunks of crust.

(Wysession, Michael E.; "Continents of the Core," N ature, 381:373, 1996)

BUT WHAT ABODT THE HAWAIIAN VOLCANIC CHAIN?

The classical, oft-repeated explanation ' for the formation of the Hawaiian chain of volcanic islands and submerged seamounts —thousands of kilometers long— is that the surface lithographie píate has been sliding over a fíxed mantle plume. The heat brought to the surface via this plume has created the volcanic chain as the surface píate has drifted over it during the past 73-or-so million years.

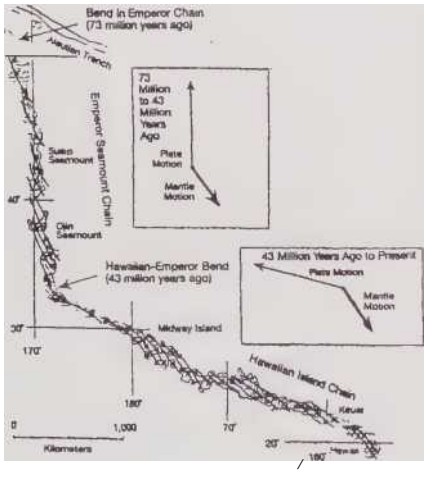
Obviously, this model is starkly con-tradicted by the fossil plume under South America (described above) that seems to have been firmly attached to the South American píate for 120 million years. No differential motion there!

Now, from a different line of evi- dence, P.D. Ihinger is ehallenging the well-entrenched "Hawaiian-volcanic- chain" theory. For example, the Hawaiian volcanoes do not line up exactly. There are dozens of short, overlapping seg- ments rather than a continuous trace across the Pacific basin. On the map, you will also see a sharp dog-leg in the trace, Further, the volcanoes Mauna Loa and Mauna Kea, only 40 kilometers apart, disgorge lavas that are distinctly different. Something is not right!

Ihinger postulates a strong mantle current flowing ponderously under the Hawaiian chain, disseeting the rising plume of hot rock into small "plumelets". These discrete blobs of hot rock are dis-persed by the current of semi-solid rock and disrupt the expected simple pattern.

(Ihinger, Phillip D.; "Mantle Flow be- neath the Pacific Píate: Evidence from Seamount Segments in the Hawaiian- Emperor Chain," American Journal of Science, 295:1035, 1995. Also: Monas- tersky, R.; "Volcanoes Reveal Earth's Hidden Currents," Science News, 148: 357, 1995)

Comment. Although a bit abstruse, these geological anomalies detected under South America and Hawaii threaten one of the crowning achievements of modern geology and geophysics.



The Hawaiian Island-Emperor Seamount chain. Individual volcanoes (Xs) line up on short, disjointed segments rather than on the expected continuous line.

SAND AND SNOYf DUNES

SATELLITE SPIES STRANGE STRIPES

ERS-1, Europe's remote-sensing satellite, snapped some pictures of Australia's Nullarbor Plain that have geologists scratching their heads. The Nullarbor Plain, which has long been billed as a vast, featureless desert, is crossed by five long, parallel lines, 15 kilometers wide and 600 kilometers long. These huge stripes would seem to be too big to miss, but ground-based surveys see nothing obvious. Even more curious, infrared sensors on a US weather satellite also see the five stripes. As the Nullarbor Plain cools off at night, the stripes are found to be about 2°C cooler than the surrounding terrain.

Could they be fault lines? Geologists have not found any in the area.

(Anderson, Ian; "Satellite Spies Strange Stripes in the Desert," New Scientist, p. 10, September 3, 1994)

Comment. Are these stripes akin to the man-made Nazca Unes etched upon Peru's high desert? Not likely; they are too big. Instead, we wonder whetlier they might be associated with the NuUarbor Plain's massive lode of meteorites.
(vol. 1, p. 76)

SAND DUNES INVISIBLE AT GROUND LEVEL

July 12, 1979, In an aircraft flying over the deserts of Central and Northwestern AustraUa.

> For mile after mile on the surfaces of the Gibson and Great Sandy Deserte, shown up very clearly by the low sun, there were long paraUel features that looked Uke low ridges. They were aligned south-east to north- west or maybe east-south-east to west- north-west. I carne to the conclusión that they were sand dunes, aUgned along the prevaiUng wind, and I further concluded that Langmuir circula- tions (longitudinal roU vórtices) were responsible for them.

The observer, meteorologist M. Walker, later queried his scientific colleagues, but no one had ever heard of these low- rise dunes before.

(Walker, Malcolm; "Sand Dunes Seen from the Air?" Weather, 56:115, 2001)

Comments. Thousands of square miles of some AustraUan deserts are also marked by many-mile-long "fossil string dunes." However, these are prominent, impres- sive from the air, and well-known to AustraUan scientists.

(KeUy, A.O.; Impact Geology, Carlsbad, 1985, p. 120)

Since the sun was low during the observation of the dune-Uke features, a remóte possibiUty exists that the markings were diffraction patterns of shadow bands, such as are sometimes seen on fíat plains situated to the east of mountains in the western U.S. These shadow bands occur as the setting sun dips behind mountain ranges. In AustraUa, though, mountain ranges adequate for this optical effect are rare. (See GEL10 in our catalog Rare Halos. ■.)

DUNE CIRCLES OF SOSSÜSVLEI

The Dead Pan of Sossusvlei Ues in the Namibian Desert some 50 kilometers from the Atlantic Ocean. It is a 5-hour drive from Windhoek, the capital of Namibia. GeologicaUy, this feature is a clay pan in the flood plain of the Tsauchah River, which flowB on the average only once in a decade. Towering above the clay pan are sand dunes that reach 350 meters elevation above the river bed. They are veritable mountains of sand and the taUest dunes in the World. The potential anomaly at Sossusvlei is not the size of the dunes but rather the mysterious circles of grass that grow upon them.
AU we have to go on is a photograph showing a dozen or so of the circles situated at some unspecified distance from the photographer. Somewhat irregular in shape, the circles seem to be on the order of 100 meters in diameter. No grass at all grows within the rings of thick grass, but outside grow sparse, evenly distributed grass clumps. The writer of the Sossusvlei artide labels the circles "unusual phenomena."

(Pupkewitz, Tony; "Sossusvlei," Optima, 36:136, 1988. Cr. P.A. HUI. Optima is a South African pubUcation.)

Comment. Are these circles akin to the "fairy rings" found in moister climates? Perhaps also pertinent are the clones of creosote bushes which grow outwards in expanding circles, as mentioned in a fascinating recent article on giant aspen clones, which may be a milUon years oíd!

(Grant, Michael C.; "The TrembUng Giant," Discover, 14:82, October 1993)

INTIMATE ENCOUNTERS OF SAND DUNES

Urged along by a persistent wind, crescent-shaped "barchan" sand dunes creep across flat desert terrains a few tena of meters per year. The smaller dunes are speedier and sometimes over- take their larger brethren. When such a collision occurs, one of three phenomena will occur.

(1) Really big dunes wlll swallow and digest the impudent smallest ones.

(2) If the dune height difference is modérate, "breeding" transpires, ending with the birth of a baby dune at each horn of the larger dune.

(3) At certain height differences, the smaller dune seems to melt into the larger dune and reemerge intact on the lee side, thereafter continuing its jour- ney as if nothing untoward had happened. Actually, the smaller dune was absorbed by the larger and a brand-new dune of about the same size and with different sand was disgorged on the lee side of the larger dune.

These bizarre dune phenomena can be ob ser ved in the big dune fields near Laayoune, Morocco. Although the above three phenomena seem unlikely-----particu- larly number 3, they are described well by solitary-wave theory. In other words, they are curious but nonanomalous since they have good explanations.

(Schwammle, Veit, and Herrmann, Hans J.; "Solitary Wave Behavior in Sand Dunes," Nature, 426:610, 2003)

Comment. We note in passing that the dreaded tsunamis of the oceans are also solitary waves described by the same theory. Tsunamis, though, are much faster. Their velocities are a function of ocean depth and may reach jet speeds on the deep ocean.

THE NEBRASKA SAND HILES: WIND OR WATER DEPOSITS?

In response to the item on p. 186 about possible massive flooding in Siberia, E. Hansen sent the accompanying mosaic of Landsat photographs of northwestern Nebraska. On this, the famous Nebraska sandhills appear like giant ripples. The width of the mosaic is about 340 kilo- meter s, so you can appreciate the scale of the hills themselves. The crest-to- crest distances seem to be 2-3 kilo- meters. Roughly 35,000 square kilometers are covered with a sheet of sand that averages 8 meters thick.

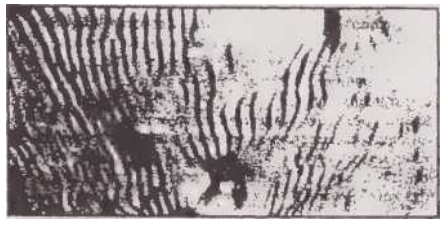
Mainstream geologists write these sandhills off as eolian (wind-carried) deposits laid down during the late Plei- stocene. Hansen, however, along with geológica! iconoclast A. Kelly, demur.

The Nebraska sanhills, they aver, were actually deposited by a wall of water sweeping down across the continent from the north—very likely the consequence of an impact of a large asteroid. For more on Kelly's rejection of the eolian theory and many additional examples of deposits by huge tsunamis or marine incursions, see his book Impact Geology and/or category ETM7 in our catalog volume: Carolina Bays, Mima Mounds, etc.

(Hansen, Evan; personal communication, March 26, 1994)

FROZEN IN TIME

A map of Antárctica produced in 1997 using data from the Canadian satellite Radarsat has revealed some unexpected geological features at the bottom of the planet, Among these are vast areas of previously unrecognized snow dunes----- ah lined up in parallel like the ripples on a stream bed. However, these snow dunes are no ripples. They measure up to 100 kilometers in length with separa- tions of 1-2 kilometers. They are, in fact, called "megadunes." At ground level, though, the snow dunes are not obvious because they are only a few meters high.



Antarctic "megadunes" discovered by the Canadian satellite Radarsat.

Since Antárctica is often buffeted by fierce winds, one would naturally think that these snow dunes have an aeolian origin like desert sand dunes. This does not seem the be the case. Comparisons made using recently declassified images taken in the 1960s by U.S. military satelütes reveal that the snow dunes have not moved in over 30 years! Some- thing besides wind-driven snow must be helping to sculpt these immense station- ary patterns.

(Tomlin, Sarah; "Vast Snow Dunes Fro- zen in Time," Nature, 402:860, 1999)

Comment. The fossil "string dunes" of Australia closely resemble the Antarctic snow megadunes in pattern and size, but of course they are composed of sand. "Megaripples" charted by sonar and shaped by water currents on the ocean floors are also comparable. See ETR3 in Carolina Bays for more.

PATTERNED GROUND

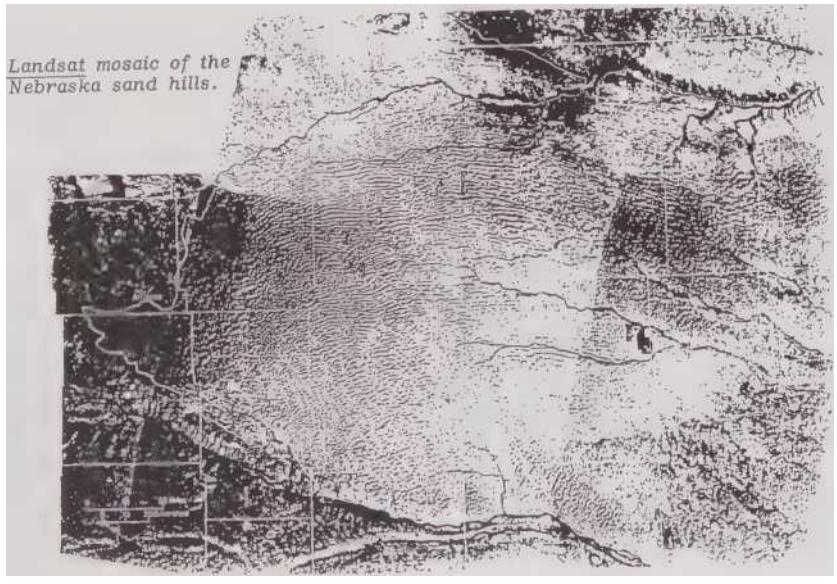
NATURAL GROUND PATTERNS ON TWO PLANETS

Early in 2003, many science magazines and even some daily papers caught their readers' attention with photographs of wide swathes of Arctic ground covered with 6-feet-wide doughtnuts of small stones. These circles and several other types of "patterned ground" are created by the nudging forces of freeze-thaw cycles that pile up rócky debris.

It is fashionable and reputation-enhancing today for scientists to develop Computer models of the phenomena they study. M.A. Kessler and B.T. Werner have mimicked byte-wise several varieties of patterned ground. To the freeze-thaw forces they added gravity-induced mini-avalanches. Their Computer drew up doughnuts, stripes, or polygons, de-pending upon the number of stones per unit area.

However, in the dry valleys of Ant-árctica, where thawing is very rare, a different explanation is required for the patterned ground observed covering glacial ice. There, another geologist, D.R. Marchant, hypothesizes that the sharp temperature changes create cracks in the glacial ice supporting the rocky debris. The debris, plus snow and dust, falls into the cracks. Vapor from sub- liming ice widens the cracks. The result over the years is a network of furrows surrounding rubble-topped polygons.

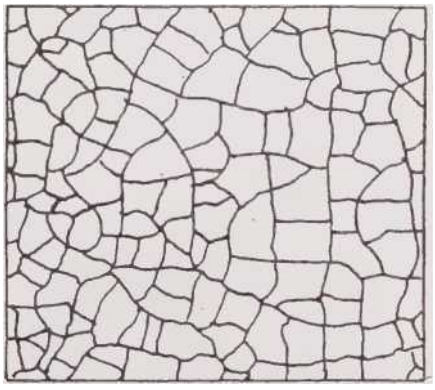
One sees in these polar-climate ground patterns the action of natural forces that might explain the polygonal patterns observed at at least 600 sites on Mars. The Martian polygons are very large compared to those in earth's polar re- gions (30-200 meters wide). And was there ever enough water on Mars for freeze-thaw cycles to mold the patterned ground seen there? The Odyssey probe does detect considerable water below the patches of patterned ground in the Southern polar regions of Mars. So, the answer there may be YES. But in the northern hemisphere there is little sign of subsurface water. Possibly an entirely different phenomenon prevails there.



Landsat mosaic of the Nebraska sand hills.

(Perkins, Sid; "Patterns from Nowhere," Science News, 163:314, 2003.)

Coroment. The above artiele does not mention the giant desiccation polygons occurring in parís of the American Southwest. These rival the size of the Martian polygons. (See figure.) It is challenging to explain the long-range order seen in both the terrestrial and Martian giant polygons.



The fissures in giant polygonal mud cracks in North American playas may be 5 meters deep and 300 meters long.

SELF-ORGANIZED STONE STRIPES

Geometrically regular stripes of stones are found on many unvegetated alpine and polar hillslopes; known as 'sorted stripes' because of the char- acteristic textural sorting between surface stones and fine-grained soil, they contrast markedly with the laek of order typical of natural landscapec. The spacing of the stripes can ran o from centimeters to meters (about 10-20 times the average stone dia- meter), with individual stripes ex-

Sorted stone stripes 12-13 centimeters apart on a 15° slope near the summit of Mauna Kea, Hawaii. They extend for tens of meters. (S. Porter)

tending downslope for many tens oí meters. A variety of formative medí- ■ anisms have been proposed, but it is still unclear how such orderly stripes can arise spontaneously, and what dictates the spacing.

B.T. Werner and B. Hallet, authors of the foregoing partía! abstract, have mathematically simulated the displacement of surface stones under the forces gen- erated by the growth of needle ice in the underlying soil. Ab the number of freeze-thaw óyeles increases into the thousands, Computer simulations show the surface stones gradually arraying themselves into linear patterns.

(Werner, B.T., and Hallet, B.; "Numer- ical Simulation of Self-Organized Stone Stripes," Nature, 361:142, 1993)

ABYSSAL HILLS

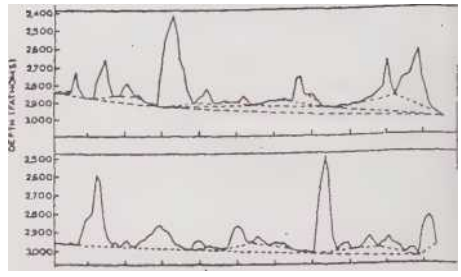
THE EARTH'S MOST COMMON TOPO- GRAPHICAL FEATDRE: ABYSSAL HILLS

All of the continente put together do not cover even half the area occupied by the abyssal hills, which domínate 60-70% of our planet's surface. We hear a lot about the endless steppes of Asia and the immensity of the Sahara, but who writes about the earth's dominant geomorphological feature? The abyssal hills are left out of the textbooks be- cause so little is known about them.
They are hidden under 3 kilometers of water. Individual abyssal hills rise 100 2,0 meters from the ocean floor; they are about 7-15 kilometers across.; their lengths are not well known. We know them mainly from fathometer readings.
If we could see them visually, they would probably look like the Appalach- ians from an airplane; that is, wash- board-like. Although heavily draped with pelagic sediments, the abyssal hills are believed to have been shaped by faulting and volcanic activity. K. Mac- Donald and coworkers at the University of California, Santa Barbara, now believe that both processes are involved:

> On the basis of data obtained last January on a series of dives along the East Pacific Rise (EPR), a ridge that runs off the coast of Central and South America, researchers theorize that the linear ridges of abyssal hills, which decórate the ocean floor somewhat like ribs on a washboard, are formed by an inter- play between both volcanic eruptions and faulting action.

(Anonymous; "Geologists Offer New The- ory on Origin of Abyssal Hills," Eos, 75:234, 1994. Background source: Fair- bridge, Rhodes W., ed.,; The Encyclo- pedia of Oceanographv, New York, 1966.)

Comment. But why would 60-70% of the earth's surface be wrinkled like this? The theory proposed above is too general to be very helpful.



Typical depth profiles revealing the dimensions of the abyssal hills: the earth's most common but least under- stood terrain. (Top) Horizontal interval are 0.577 nautical mile. (Bottom) 0.588 nautical mile.

FLOOD DEBRIS

BACK TO SIBERIA: THE BIGGEST FLOOD?

14,0 BP, Deep in the Altai Mountains of Southern Siberia. About this date, a wall of water 1,500 feet high surged down the Chuja River valley at 90 miles per hour. How does one deduce such a hydrological cataclysm? A. Rudoy, a geo- logist at Tomsky State Pedagogieal Insti- tute, points to giant gravel bars along the Chuja River valley. These are not the inch-sized ripples we seen on the floors of today's rivers; these are giants measuring tens of yards from crest to crest. Only a catastrophíc flood could have piled up these ridges of debris. Rudoy postulates that, during the Ice Ages, a huge ice dam upstream held back a lake 3,000 feet deep, containing 200 cubic miles of water. When the ice dam suddenly ruptured, all life and land downstream was devastated.

(Folger, Tim; "The Biggest Flood," Discover, 15:36, January 1994)

Comment. The breaking of Pleistocene ice dams also carved up parts of North America. There was the famous Cincin- nati ice dam and, of course, the Spo- kane Flood that gouged out the Chan- nelled Seablands of the Pacific Northwest, when Lake Missoula catastrophi- cally emptied into the Pacific. See ETM5 in Carolina Bays, etc.

But other thoughts intrude: Were the heaps of mammoth carcasses and the Siberian "ivory islands" the conse- quences similar Siberian floods?

ICE PHENOMENA

LARGE ROTATING ICE DISCS ON ICE-COVERED RIVERS

The fringe literature has made much of the huge, slowly spinning dises of ice seen on some rivers in northern climes. UFOs are connected somehow. Or, more recently, they must be associated with the infamous crop circles! These pon- derously rotating ice dises have also caught the attentions of scientists, who have been able to dispel some of these wild speculations.

One well-observed ice disc formed on the Pite River in northern Sweden in 1987. It was rotating in a circular hole in the ice covering the rest of the river.

> "The rotating ice disc had a diameter of 49m [just over 160 feet] while the hole in the ice was 54m in diameter. The time of one full rotation was measured at 545s and 575s on 20 and 24 January respectively. ünverified measurements suggest that -the time of rotation had been about 8 min a few weeks earlier. The rotation of the ice disc was anticlockwise and for most of the time the disc was in con- tact with the border ice. This con- tact point moved clockwise, i.e. the ice disc was not 'rolling' on the walls of the hole. This erosión by contact, which caused a low-frequency sound, explains why the hole in the ice was kept open for months."

The ice thickness was 0.43m. Esti- mated weight of the ice disc = 864 metric tons—almost 2 million pounds!

Formation of the disc began when ice floes formed upstream were captured by a big Whirlpool just as the river was beginning to freeze over. As more and more floes accumulated, the disc grew. Friction with the surrounding river ice rounded off the edges until it was nearly a perfect eircle

Although no deep mystery is involved here, the authors of the referenced article admitted that:

> "The mechanisms that form and drive the rotating ice disc are not yet known."

(Nordell, Bo., and Westerstrom, Goran; "Large Rotating Ice Dises on Ice- Covered Rivers," Weather, 52:17, 1997)

160-feet-diameter, rotating ice disc in the Pite River, Sweden, 1987.

AN ICE RING IN A CAN ADIAN POND

Ice rings (really ice "dises") are large circular dises of ice that occasionally form in rivers. One well-observed ice ring appeared in the Pite River in northern Sweden in 1987. About 100 feet in diameter, it was rotating slowly within a slightly larger hole in the ice covering the rest of the river. (above) This ring was fashioned out of ice floes that had been captured by a Whirlpool and set spinning. Its rough periphery had been "machined" to circular perfection over a period of weeks as it rotated ponderous- ly within the confining river ice.

A curious phenomenon is this, but one that seems to yield to simple explanaron rather easily.

Somewhat more puzzling is a 16-foot ice ring that formed overnight in the more placid waters of a farm pond near Delta, Ontario, in December 2000. The ice was too thin to walk upon, so it had to be a natural phenomenon. However, there was no Whirlpool to provide the lathe-like action needed to create the neat disc. Ñor was the disc said to be rotating when diseovered. The whole event happened very quickly, too.

(Bronskill, Jim; "Strange Ice Rings Baf- fle Researchers," Toronto National Post, March 8, 2001. Cr. G. Duplantier Via L. Farish)

Comment. Even small farm ponds have some circulation of water, particularly if fed by a stream. Rather than trying to associate ice rings with crop circles, as some do, it would be better to find out what's happening below the ice!

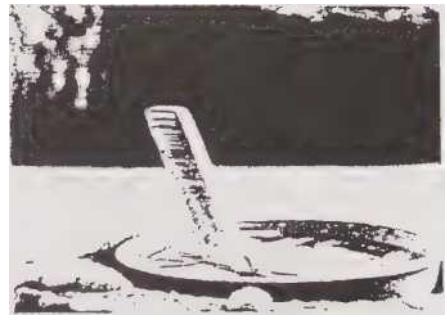
WEIRD ICICLES

The British journal Weather has pub- lished two more photos of upside-down icicles. We reproduce one that is typi- cal of the genre. [Another growing at an angle from a birdbath is mentioned in vol. 1, p. 205.] In the formation of such icicles, liquid water is somehow forced upward from a reservoir through a central channel. As it reaches the top, it freezes. If this is indeed the mechan- ism, why do these upside-down icicles usually form crystal-like prisms with fíat sides?

(Bjdrbaek, Gustav; "Unusual Ice Forma- tions," Weather, 50:188, 1995)

Delightfully, the plot becomes more twisted with a beautiful horizontal heli- cal icicle that was photographed in New Zealand. This truly strange icicle looks like a horizontal bedspring 6 inches long and 2 inches wide. There are eight complete turns in the helix. It haB grown several times from a hairline crack in a handrail support which filis with water during a rainstorm.

(Dowden, Richard, et al; "Helical Ici- cle,[11] Weather, 49:435, 1994)



Prism-like, slanted icicle growing upward in a Sussex birdbath. December 21, 1992.

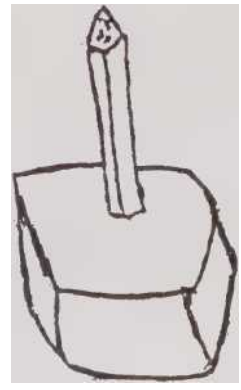
"WEIRD ICICLES" IN A REFRIGERATOR

Birdbaths, it seems, are not essential for the generation of tilted, upwardly growing, crystalline icicles. From St. Louis, C. Masthay writes:

> "In Science Frontiers 100, p. 2, Jul.- Aug. 1995, you have the article WEIRD ICICLES. Well I've jUBt got to tell you about the icicle in my ice- cube tray. I went to. Connecticut on vacation for 2 weeks the latter half of this June (1995). Sometime during that time the electricity was out for 3i hours. When I opened my refriger- ator for a drink, there was a weird stalagmitic icicle with a faint frosti- ness on the cystalline end. I left it alone for these 2 weeks to watch it recede with my frost-free refrigerator. When I saw your article, I regarded the explanation of a central channel as being inappropriate, for this one had to grow as a normal crystal in the unaccustomed rise in temperature. It too had a tipped angle of perhaps 10° to 15°. What is more is that this is the second time this has happened in a year. How many other refrigera- tors have done the same? Thus the birdbath crystal is not impossible."

(Masthay, Cari; personal communication, July 17, 1995.)

Questions ■ Why are all of these upward-growing icicles inclined slightly? Why are they all prismatic in contrast to those hanging from our eaves?



Sketch of an upwardly growing icicle in a refrigerator.

A HOLLOW, TRIANGULAR ICICLE

We swore that we were not going to pass along any more "weird" ieicle observa- tions—and there are many of them—but this one is the weirdest of the weird,

The scene is a Norwich, England, garden, wherein one night a plástic saucer fuU of tap water was placed. The night was clear, eold, and windless. In the morning, T. Bushnell found protru- ding from the saucer a "strange tube- like structure" about 3 inches long. His color photograph cannot be conveniently reproduced here, but it clearly shows his icicle growing upward at about a 45° angle. Bushnell wrote further:

> "What may not be apparent from the picture is that the tube is triangular in cross section and it is completely hollow down as far as the unfrozen water lying underneath the thick layer of ice. The fairly robust tube was an integral part of the under- lying ice pool. We noticed that the outside of the tube was segmented in appearance, as though the ice had built up layer by layer."

(Bushnell, T.; "Ice Surprise," New _ Scientist, inside baek cover, October 7, 1995)

Comment. The other "weird" ieicles we have reported were all solid and roughly hexagonal prisms. (p. 187 and vol. 1, p. 204)

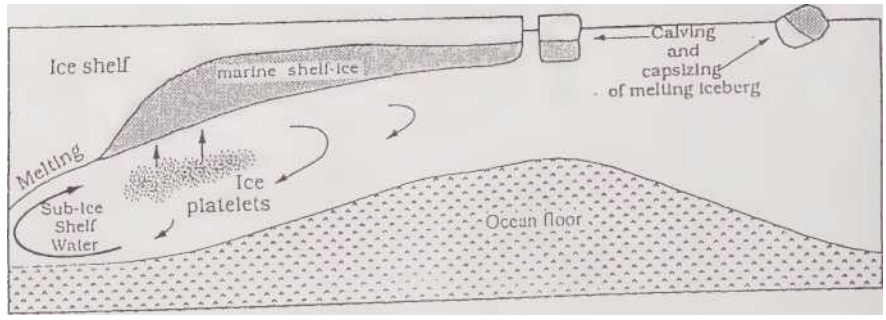
THE BOTTLE-GREEN ICEBERGS OF ANTARCTICA

Antarctic icebergs frequently incorpórate sediments that turn them dark, even zebra-striped on occasion. But it is the bottle-green icebergs that provoke the most interest, for it is not certain why they are green. Is it due to intrinsic optical properties of the ice or impuri- ties? A recent paper by J. Kipfstuhl et al suggests the latter and tells us where these translucent, strikingly green bergs origínate.

> "A comparison of samples from a trans- lucent green iceberg with a core from the Ronne Ice Shelf revealed an excellent agreement in isotopic eom- position, crystal structure, and in- corporated sediment partióles. Marine shelf ice which constitutes the basal portion of some ice shelves is con- sidered to be the source of green icebergs. It [the green ice] most likely results from "ice pump" pro- cesses which produce large amounts of ice platelets in the water column beneath ice shelves. These subse- quently accumulate and become com- pacted into bubble-free, desalinated ice."

The inclusions in the green ice are probably trapped by the accumulating platelets. Sinee the green ice is eon- fined to the bottoms of the bergs, it becomes apparent only after the bergs capsize. The green icebergs in the Wed- dle Sea origínate mainly from the Amery Ice Shelf.

(Kipfstuhl, J. et al; "The Origin of Green Icebergs in Antárctica," Journal of Geophysical Research, 97:20,319, 1992)



Model of green-iceberg formation. Convective currents driven by the change of freezing point with pressure causes melting near the grounding line and leads to the formation of ice platelets containing inclusions in the ascending water. The marine shelf ice thus formed may be green in color.

Similar phenomenon. The ice calving from Alaskan glaciers is often a beauti- ful blue color-----the eonsequence of the ice's high density rather than inclusions. Alaskans export this ice to Japan where it is popular in drinks at tony parties!

ALASKAN GLACIER SURGES

The Bering Glacier is the largest ice stream in North America. About every 20 years, it surges forward dramatically.

Early in 1993, a small section began to accelerate its descent down toward Vitus Lake. Now, fuUy half of this giant ice stream---2,000 square kilometers of it------ is pushing forward at speeds up to 100 meters per day. This is about 14 feet/ hour and pretty speedy for a slab of ice that would measure 30 x 30 miles if sqyare, which of course it isn't.

The usual explanation for surging glaciers appeals to the lubricating pro- perties of meltwater building up under the glacier. But can this theory apply to such a massive sheet?

(Anonymous; "Alaskan Glacier Races Forward," Science News, 144:333, 1993)

CLIMATE PHENOMENA

BURPS OF DEATH

Not only did the poor dinosaurs have to contend with an asteroid impact and a lurch of the poles, but also with the possible ignition of voluminous methane burps.

65 million years ago. This was the time of the well-publieized, but still hypothe- tical, asteroid impact. It is said to have wreaked havoc on our wounded planet and, especially, the dinosaurs. Voléanos spewed out vast lava flelds and flUed the air with greenhouse gases and dust. It was a bad time for many life forms.

Actually, it may have been far worse than generaUy advertised. In addition to the volcanic activity and climate change, the shock of the asteroid impact could have been sufficient to destabilize the immense amounts of methane hydrate that have long been locked up, frozen and dormant, in oceanic sediments all over the World.

According to this scenario, once the shock of the asteroid impact released the methane from its icy prison, it rose to the surface of the oceans in a world-wide burp. Methane, unfortunately for the dinosaurs and many other life forms, is highly flammable, Lightning could have ignited it almost immediately if it was concentrated enough. A colossal firestorm might have then enveloped the entire planet. The whole atmosphere could have been afire. This, according to B. Hurdle and coUeagues at the Naval Research Laboratory, who speculate that the dino- saur hegemony may ended suddenly in flames rather than in a long, drawn-out whimper.

(Day, Michael; "Hell on Earth," New Scientist, p. 5, November 20, 1999)

FUZZ IN THE CLIMATE RECORD

CUmatologists have bet heavily on their analysis of cores extracted from the ice sheets of Greenland and Antárctica. Their trace impurities are beheved to accurately record the earth's climate over the last several hundred thousand years. The temporal accuracy of this record is based upon the assumption that these impurities have not migrated vertically from where they were deposi- ted. This assumption is now under severe stress with the discovery of anomalous diffusion within ice plus a phase phenomenon ealled "premelting,"

both of which result in the transport oí the climate-marking impurities far from their original layer of deposition.

A.W. Rempel et al write below (in the jargon of climatologists):

> ... under conditions that resemble those encountered in the Eemian inter= glacial ice of central Greenland (from about 125,000 to 115,000 years ago— impurity fluetuations may be separated from ice of the same age by as much as 50 cm. This distance is comparable to the ice thickness of the contested sudden cooling events in the Eemian ice from the GRIP core.

Translation: The accepted picture of the earth's climate history over the last few hundred thousand years may be seriously distorted.

(Rempel, A.W., et alj "Possible Displacement of the Climate Signal in Ancient Ice by Premelting and Anomalous Diffu- sion," N ature, 411:568, 2001)

Comment. This discovery could impact the global-warming controversy as well as our model of human activities during the Ice Ages.

55 million years ago. Ten million years after the dinosaurs may have roasted in a global flrestorm, another methane burp may have erupted from the oceans. This burp was slower and did not ignite but was just as lethal. It filled with atmo- sphere with a highly effective green- house: methane. The result was a pulse of global warming; as seen in a 5°-7°C increase in the temperature of ocean- bottom water during that period.

Biologieal evidence for the event occurs in the skeletons of marine animáis that litter the ocean sedimenta laid down in that lethal period. On the land, prior to the methane release, North America was populated by an odd assortment of unfamiliar mammals; "unfamiliar" to us today because tliey left no descendente. These archaic mammals succumbed to the effects of the sudden global warming and were ultimately replaced by the ancestors of our familiar deer, horses, and canines that streamed across the now-open Bering Land Bridge. ■

Geology, too, provides evidence of this traumatic event. Ocean-bottom cores reveal landslide debris that was probably triggered by the sudden decomposition of great masses of methane hydrate. Seismic probes of the ocean sediments reveal chaotie zones suggesting a violent event.

(Kerr, Richard A.; "A Smoking Gun for an Ancient Methane Discharge," Science, 286:1465, 1999. Monastersky, R.; "Global Burp Gassed Ancient Earth," Science News, 156:260, 1999)

Philosophical observation. Just as natural fires of grasslands and forests eventually lead to vigorous new growth, it appears that methane (a natural pro- duct of the decomposition of organic material) also sweeps out oíd species and replaces them with new ones. No doubt this planetary cleansing is another ramification of the Gaia Hypothesis.

Be advised that Gaia still lives, and that huge, unstable, methane-hydrate deposite still lie buried under many continental shelves.

GLOBAL PHENOMENA

PLATE-TECTON1CS PROBLEMS

DO CONTINENTS REALLY DRIFT?

For geologists, Continental Drift (or "Píate Tectonics") is as vital to their scientific outlook as the Big Bang is to astronomers, or Evolution to biologists. Indeed, Continental Drift is taught as an unassailable hypothesis-----in essence, a "fact." It is, therefore, a tempting target for anomalists.

Fortunately, there are some maverick geologists who are willing and able to draw up a list of argumenta against the "fact" of Continental Drift. Australian P. James is one such brave soul. Here follows the abstraet from one of his papers.

> Anomalies in the three basie concepts of mobile píate tectonics----sea-floor spreading, transfoTm faults, subduction—are analysed. The procesa is then extended to subsidiary as- pects; sediments on a moving base- ment, continental evidence, mecha-. nisms and measurements. In summation, the criticisms present a for midable and damaging document against the total framework of mobilism, both in its general concepts and it its detailed interpretations.

From James' lengthy paper, we seleet just two anomalies that he has identified in the Atlantic where North America and Europe are supposedly drifting apart.

First, repeated direct measurements of the drifting seem to be a washj that is, there is no drift to speak of. The expansión of the Atlantic basin seems to be only 5-13 mm/year (just 20% of the predicted rate), and this is partially offset by apparent contractions within the North American land mass!

Second, St. Peter & Paul Rocks, on the Equator just west of the Atlantic Ridge, are supposed to be riding west on the spreading sea floor. Being cióse to the ridge, they should be 15-30 million years oíd. (The closer islands are to the Ridge, the younger they should be, if they are truly riding on a sea-floor conveyor belt.) But radio- metric dating of the rocks making up these islets insists that they are 100800 million years oíd.

(James, Peter; "A Synthesis of Major Objections to Mobile Píate Tectonics," New Concepts in Global Tectonics, no. 2, p. 6, March 1997)

THE DPS AND DOWNS OF PLATE TECTONICS

When we first began collecting anomalies in the 195Os, píate tectonics (nee "continental drift") was considered pseudo- science. In fact, it was possible to find authors in mainstream geological journals complaining the geology could not cali itself a Science- if it permitted ideas like continental drift to run rampant. Of course, the situation has now been re- versed as some scientists plead that data contradicting píate tectonics should no longer be accepted for publication!

Happily, at least one publication is still open to heretics. In a 1997 number of New Concepts in Global Tectonics, we find S. Keshav, at Bombay's Indian Institute of Technology, asserting that píate tectonics is a "myth that has para- lyzed our thinking." And he gives some reasons for his view:

- Píate tectonics incorporates many physically impossible processes, such as sediment subduction; i.e., soft sediments should be scraped off plates as they dive beneath the continents.
- Píate tectonics does not completely explain the ophiolites (rocks resembling bits of ocean crust that are sometimes found in embarrassing places (far inland)
- Píate tectonics has difficulty accounting for some mountain belts; i.e., those far from collisional sites, like Tibet's Kunlun mountains.

Finally, Keshav observes:

> On the continents this theory assumes mysterious character as many of the features go unexplained (as exemplified by inability to find a trace of the Asthenosphere/Moho) and truly depicts an act of escapism.

(Keshav, Shantanu; "A Myth Called Píate Tectonics," New Concepts in Global Tectonics, p. 23, no. 3, June 1997)

Comment. Keshav's objections may be a bit technical, but they reveal cracks in the foundation of a major paradigm.

GLITCHES IN THE TERRESTRIAL CONVEYOR BELT

According to píate tectonics, the earth's continents are being transported-----very slowly—on a subterranean conveyor belt of sorts. Although píate tectonics, nee continental drift, was ridiculed 50 years ago, it has been very successful in accounting for many geological phenomena. The theory is rarely challenged these days, but there are anomalies out there. .

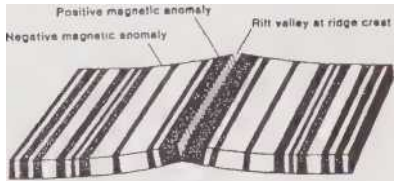
> According to the simple plate-tectonic theory, the age of oceanic lithosphere is zero at a spreading oceanic ridge and increases with distance from the ridge. Thus the lithosphere of the

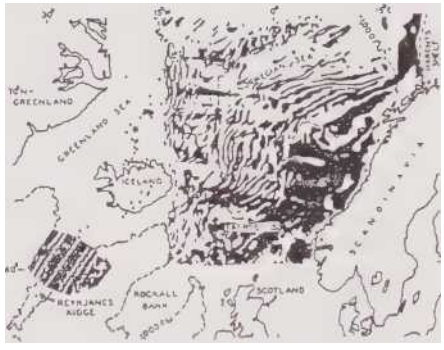
central Atlantic, which current palaeo- geographical reconstructions assure us began to open no earlier than 120 million years ago, has zero age at the Mid-Atlantic Ridge and, supposedly an age of about 120 million years cióse to the land masses of Africa and South America at the appropriate lati- tude. Yet, Bonatti and others (Nature, v. 380, p. 518, 1996) have now re- covered samples of 140-million-year- old pelagic limestones not even from the edges of the Atlantic but right in the middle of the ocean, cióse to the ridge. How can this be possible?

The only explanation (?) seems to be that this errant ehunk of crust got "trapped" in the middle of the Atlantic —like a misdirected suitcase on an air- port conveyor belt.

(Anonymous; "Oíd Rocks near the Mid-Atlantic Ridge," Geology Today, 13:17, 1997)

Background. Ocean crust is presently being formed by upwelling molten rock at the Mid-Atlantic Ridge and, conse- quently, has zero age. The oldest ocean crust is adjacent to the continents. __





Two kinds of marine magnetic anomalies. (Top) Idealized stripes straddling a rift valle y. (Bottom) Actual magnetic anomalies in the North Atlantic. A large differ- ence exists between theory and reality.

PLATE TECTONICS SUBDUCTED?

In the Fall 2000 number of the Journal of Scientific Exploration, D. Pratt fired a thunderous broadside at that revered paradigm of geophysics: píate tectonics, nee continental drift. This 47-page study, which ineludes 10 pages of references, is best summarized by quoting from the author's own conclusions.

Píate tectonics—the reigning paradigm in the earth Sciences—faces some very severe and apparently fatal problems. Far from being a simple, elegant, all-embracing global theory, it is confronted with a multi- tude of observational anomalies and has had to be patched up with a com- plex variety of ad hoc modifications and auxiliary hypotheses. The exis- tence of deep continental roots and the absenee of a continuous, global asthenosphere to "lubrícate" píate motions has rendered the classical model of píate movements untenable. There is no consensúe on the thick- ness of the "platee" and no certainty as to the forces responsible for their supposed movement. The hypotheses of large-scale continental movements, seafloor spreading, and subduction, as well as the relative youth of the oceanic crust are contradicted by a substantial volume of data. Evidence for significant amounts of submerged continental crust in the present-day oceans provides another major challenge to píate tectonics.

(Pratt, David; "Píate Tectonics: A Paradigm under Threat," Journal of Scientific Exploration," 14:307, 2000)

Definition. Asthenosphere = upper mantle, a hot, fluid layer of rock.

SUBDUCTION DOESN'T CHECK OUT

It's tempting to slough off this Ítem be- cause subduction rings few anomalists' bells. However, if the above title is con- firmed, the entire edifice of píate tectonics and our revered model of terres- trial history must come crashing down.
In fact, the title has to be most alarming to any mainstream geophysicist. (See above Ítem.)

Said contentious title appears in the relatively new journal New Concepts in Global Tectonics. The Ítem is actually a book review by I.A. Rezanov of Geology of Trenches and Island Ares in the Pacific Ocean, by B.I. Vassiliev and D.R. Choi. This doesn't sound very ex- citing so far!

Why should we pursue such an eso- teric subject in Science Fx*ontiers,

First, we must understand that oceanic trenches are deep gashes in the earth's integument (some 6 miles deep) where oceanic plates are believed to dive under continental plates (subduction) and are then thrust deeply (hundreds of miles) into the earth's mantle. This subducted crust is pushed by new oceanic crust that is continually being created at spreading centers, such as the Mid- Atlantic Ridge. This outer edge of this spreading crust has to go some- where. NOW, if subduction is a myth, so are the spreading-crust idea, píate tectonics, and the whole concept of continental drift.

A11 is not well with the subduction idea, or with píate tectonics in general.

I. A. Rezanov writes:

The authors of the reviewed book emphasise three peculiar features of trench geology: 1) extremely thin sedimentary fill; 2) undisturbed bed- ding of strata; 3) shallow-water origin of sedimente. These three faets iden- tified by seismic sounding and deep- sea drilling are lethal blows for píate tectonics; they do not fit in absolute- ly with the concept of subduction.

The book's authors also conclude that all oceanic arc-trenches were probably formed recently and simultaneously.
More profound is their conclusión:

Arc-trench systems have no analogues in the past and are the producís of an essentially new global evolution phase.

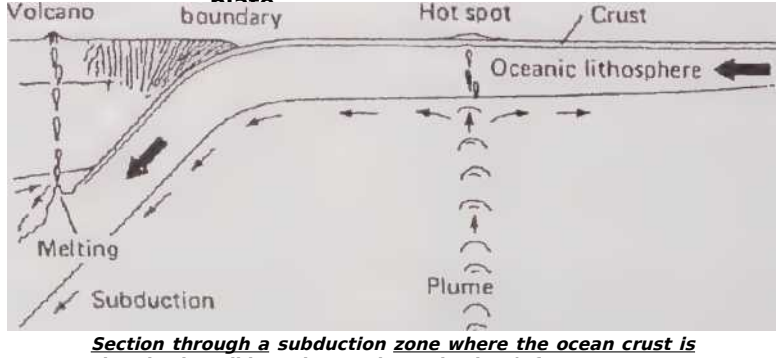
(Rezanov, I.A.; "Subduction Fails to Check Out," New Concepts in Global Tectonics, #27, p. 28, June 2003)

Comment. What could have initiated this postulated recent phase of terrestrial evolution?

MILES OF MUSH

The earth's tectonic plates are usually drawn as neatly fitting puzzle pieces. This idealistic picture is changing be- cause several lines of evidence suggest that some plates are separated by miles of geological "mush."

J-Y. Royer and R.G. Gordon carne to this conclusión after careful inspection of the huge Indo-Australian píate. First, they noticed that many powerful earth- quakes originated in the center of this píate. Usually, quakes are confined to the edges of plates where they crunch against neighboring plates. Second, a line of folds 3,000 feet high runs down the center of the píate, as if is being squeezed like an accordion. But they

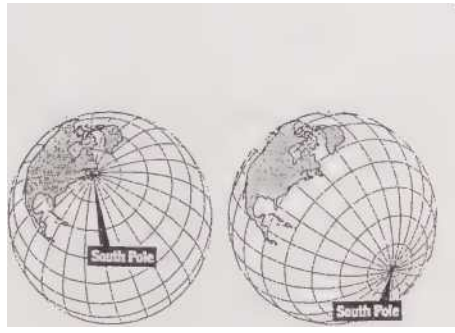


Section through a subduction zone where the ocean crust is theorized to slide under continental cnist. (After: A.N. Strahler; Science and Earth History)

cernid not Identify any geological accordionist. Finally, working backwards in time using paleomagnetic data, they reconstrueted píate configurations 11 mil- lion years ago. The Indo-Australian píate did not match up with its neigh- bors of that time period. Royer and Gordon concluded that the Indo-Austra- lian píate really consista of three smaller plates. Even more surprising was their discovery that in between the boundaries of the three new plates there is a tec- tonic morass perhaps a thousand miles wide in places—the "miles of mush" of our title.

Píate tectonics (nee "continental drift"), once a revolutionary idea in geology and geophysics, seems poised for another up he aval.

(Anonymous; "Gaps in the Theory," Earth, 7:11, February 1998)



This postulated 90° pole shift was synchronous with the Cambrian Explosión of new Ufe forms. Of c our se, North America really looked quite different then.

EARTH-AS-A-WHOLE: MISCELLANEOUS TOPICS

EARTH'S SHIFTING CRDST

Our title is identical to that of a book published by C.P. Hapgood in 1958. He also wrote The Path of the Pole (1970). Several other authors have also proposed that sudden slippages of the earth's crust caused wild climate fluctuations in the past with devastating biological consequences---in particular, all those quick-frozen mammoths in Siberia. These pole- shift scenarios coming from thinkers swim- ming far out of the scientific mainstream have been studiously ignored in a "new" and well-publicized pole-shift theory re- cently appearing in Science. The "new" theory relates to an oíd (534-million- years-ago) crustal slippage, whereas Hapgood was talking about a cataclysm within the last 10,000 years or so. Nevertheless, it would have been nice to see Hapgood's earlier work acknow- ledged.

Four features of this "new" proposal make it more palatable than Hapgood's to today's geologists and geophysicists:.

(1) Two of the "new" authors, J. Kirschvihk and D.A. Evans, are at the prestigious California Institute of Technology, while Hapgood was a PhD-less history professor at Keene State College. Status is important when theorizing.

(2) Kirschvink et al propose a scientifically acceptable meehanism for the onset of rapid crustal slippage. They visualize a huge churik of the seafloor suddenly foundering and thereby chang- ing the planet's mass distribution. This imbalance caused the continente to shift rapidly in order to restore the smooth rotation of the earth around its spin axis. Within a period of 15 million years, they envisage, the continente had slip- ped about 90°. Part of what is now North America moved from the South Pole to near the Equator. Evidence for this huge shift is seen in measurements of the earth's magnetic field frozen in the rocks. In other words, Kirsch vink et al used the methods of paleomagnetism.

(3) The "new" crustal slippage is really only accelerated continental drift (a dominant and well-established para- digm) and not the more radical notion of the entire outer layer of crust slipping over the earth's mantle like a greased onion skin. Ñor is the proposed process anything like pole-flipping, where the entire planet flips 180° like a Tippy-Top —a dynamically impossible event.
(vol. 1, p. 224)

(4) The proposed foundering of that chunk of seafloor occurred 534 million years ago, roughly coincident with the Cambrian Explosión of new life forms (new phyla). The resulting gross climate changes and environmental havoc could have been conducive to the rapid evolu- tion of life. Although today's scientists favor this linkage of catastrophism to rapid speciation, Berkeley paleontolo- gist J. Valentine admitíed that, "...it doesn't provide a specific meehanism by which animáis suddenly evolved new "body plans." Even so, scientists have long searched for an event------any event ----that might explain the puzzling Cambrian Explosión. [1]

(Kirschvink, Joseph L., et al; "Evidence for a Large-Scale Reorganization of Early Cambrian Continental Masses by Inertial Interchange True Polar Wander," Science, 277:541, 1997. Also: Sawyer, Kathy; "Global Shift May Have Sped Evolution," Washington Post, July 25, 1997)

Comment. O. K., but those much more recent frozen mammoths are still hard to explain. If a chunk of seafloor can founder once, the same thing might have happened twice—say, just a few thousand years ago.

But why should large chunks of seafloor sink so suddenly? Neither reference touches on this!

K. Wise has pointed out that actually the Cambrian Explosión did not see the greatest increase in biological innovation. The earlier Archaean Explosión produced 17 new phyla of bacteria employing an extraordinary range of different metabo- lisms. Although some 38 new phyla did emerge from the Cambrian Explosión, they utilized only one type of metabolism.

(Wise, Kurt P., "The Archaean Explosión," CEN Technieal Journal, 10:315, 1996)

Comment. What triggered the more innovative Archaean Explosión?

WESTERN OREGON NOT FIRMLY ANCHORED TO NORTH AMERICA

Global Positioning System (GPS) units reveal that western Oregon is rotating clockwise relative to the rest of North America. Part of the state is grinding against Washington. But Oregonians will not get dizzy. The periphery moves only a few millimeters each year.

(Anonymous; "In a Spin," New Scientist, p. 25, October 7, 2000. Source cited: Geophysical Research LetterB. 27:3117. 2000)

Comment. Western Oregon is probably a "terrane"—an exotic chunk of real estáte that drifted in from somewhere in the Pacific and lodged up against the North American coastline. Many such terranes have piled up against western North America in the geological past.
But what causes the differential rotation?

A UNIFIED THEORY OF GEOPHYSICS

It takes a lot of nerve to propose a theory that can unite such a fragmented field as geophysics. H.R. Shaw makes a try in his new book: Craters, Cosmos, and Chronicles: A New Theory of the Earth. Shaw's ideas have recently been reviewed in Science Nbwb and our ítem is based on that article.

Shaw contends that cosmic proyectiles ----asteroide and comets---have controlled almost all features of the earth's evolution. For example:

- Impacts have determined the positions of the eontinents.
- They have controlled the geomagnetic field.
- They have created volcanoes and massive basalt flows.
- They have caused mass extinctions.

Of course, for two centuries, other catastrophists have proposed similar dire consequences of giant impacts.- But Shaw does introduce three ideas that are worth recording here.

Large impact craters occur in swaths. Although this has been suggested be- fore, Shaw has mapped out several swaths where large craters of about the same age are located. His "K-T swath" ineludes the Chicxulub cráter (Yucatán), the Manson cráter (Iowa), the Avak cráter (Alaska), and three more in Russia—all of which were gouged out about the time of the Cretaceous-Tertiary (K-T) boundary. Shaw has plotted several other swaths of different ages.

The application of chaos theory to solar system debris. Shaw hypothesizes that nonlinear gravitational effeets channel asteroide, and comets into the inner solar system in intermittent bursts. The bursts are then captured by the earth and other inner planets, with some of these objeets grouped in like orbits.

Gravitational feedback occurs from earth to orbiting debris. Shaw believes that the uneven distribution of mass inside the earth----due probably to the impact that created the moon—influences

where asteroids and comets impact. In turn, these large objects keep smashing into the same regions and their cumula- tive effect contols the flow of material inside the earth. Then, this change in mass distribution feeds back to change orbits and impact swaths.

The above is just a taste of what is revealed in Shaw's book of 600+ pages. It cannot fail to be controversia!.

(Monastersky, Richard; "Shots from Outer Space," Science News, 147:58, 1995)

MYSTERIODS VIBRATIONS SHAKE THE EARTH EVERY 12 HODRS

> European scientists have detected mysterious and extremely strong vibrations that shake the earth at 12-hour intervals.
>
> The scientists do not know the origin of these vibrations, but they believe they come from an extra- terrestrial source and are somehow related to the gravitational pulí that - the moon and the sun exert on the earth's crust. In effect, the pulí of gravity may cause the earth's crust to púlsate in the same way gravity influences the ebb and flow of tides.

G. Pizzella and colleagues at the Uni- versity of Rome discovered these vibrations when investigating the earth's gravitational field with exeeptionally sensitive Instruments.

(Anonymous; "Vibrations in the Earth Puzzle Scientists," Geo, p. 105, January 1984. Cr. R. Calais.)

Comment. Solar tides do oecur every 12 hours, but (except at Tahiti and Tues- day Island) they are overwhelmed by the lunar tides which peak roughly 50 minutes later each day. If the mystery vibrations were tidal in nature, they should foliow the moon, not the sun!

DOES THE EARTH BREATHE?

In a superficial sense, the answer is certainly YES. By way of illustration, when a low-pressure area moves in, higher-pressure air residing in deep wells and caves comes rushing out ("ex- haling")! Attach a whistle to a likely well and you have a "weather well" that warns of the impending change'. The ex- halations of large caves ("blowing caves") can be copious and strong; so much so that some aeronautical pioneers tested their airplane models at cave mouths.

In a deeper sense, there are new measurements suggesting that the earth's solid crust also contracts by minute amounts in an annual cycle. For example, 50 GPS (Global Positioning System) sta- tions in northeastern Japan detect east- west contractions of the crust of about 50 millimeters/year. The compressions are 15% faster in the fall and 15% slower in the spring. The same rhythmic squee- zing has been discerned in a 150-meter tunnel dug into granite bedrock in the same región.

To these instrument measurements can be added the strong tendency of some major voléanos to erupt in the fall when the biggest squeeze is on. The analogy of toothpaste being squeezed out of a tube is inescapable here!

The cause of these annual "breathing" eycles is uncertain.

(Kerr, Richard A.; "Earth's Breathing Lessons," Science, 291:584, 2001)

Comment. In principie, gravity waves could cause miniscule contractions of the crust, but it is difficult to see how they could have an annual cycle.

OREGON TW1STS AND ALSO BDLGES

Oregon is a restless state from the geo- logical point of view. In 2000, GPS Global Positioning System) units revealed that much of the Oregon was rotating clockwise relative to its neighboring States—not much, just a few millimeters per year around it periphery. (p. 191) GPS units have now discerned a more alarming direction of motion: UP. A kilo- meter sized swelling has been detected just west of the Three Sisters voléanos. There, the land is bulging 30 millimeters per year. It started in 1997, and the bulge has now risen 150 millimeters (about 6 inches). That doesn't sound like much, but it represente an injeetion of a million cubic iueters of hot magma 6-7 kilometers below the bulge. If a sphere, this geologicni boil is about 350 meter s (1,150 feet) in diameter. This is only l/10th the amount magma that caused Mount St. Helens to blow its top, but this bulge bears watching.

(Kerr, Richard A.; "Oregon's Bulging Unabated," Science, 295:260, 2002.)

Cross reference. See relevant "thermal bulges" on p. 183.

LEAKY SEAS

Just as we have been assured that the Greenhouse Effect is melting the ice caps and that rising ocean levels will forcé us to abandon our coastal cities, we read the following:

> Within a billion years, our planet could be as dry and barren as Mars, claim geologists in Tokyo. They have calculated that the oceans are leaking water into the Earth's mantle five times as fast as it is being replen- ished.

It is true that ocean water is being drained away at subduction zones where oceanic crustal platee dive under the ^ continental plates; there's a 10,000-mile unsealed crack there. S. Maruyama and colleagues at the Tokyo Instituíe of Technology estímate that 1.12 billion metric tons of water leak through that crack in the earth's integument every year. Geologists have always assumed that most of this leakage was returned to the oceans through deep-sea venís and volcanic action, but Maruyama calcu- lates that only 0.23 billion metric tons are recovered. The balance is probably absorbed by lawsonite and other minerals forming 100 kilometers below the surface.

(Hadfield, Peter; "Leaky Seas," New Scientist, p. 4, September 11, 1999)

Comment. Does this mean we should cease our attempts to stem global warmlng?

STRATIGRAPHY

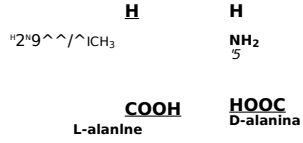
METEORITES, GLASSES, TEKTITES

Ámong the superficial deposits of sand, soil, and stones that cover much of our planet's surface are found objects that scientists think either originated in óuter space or were forged when the debris from meteor impacts reentered the atmosphere and fell to earth; i.e., the "tektites."

_*Meteorites. Claims for meteorites from Mars and meteorites containing biochemicais and hints of life forms. See p. 71 for the astronómica! characteristics of meteors.

• Impact glasses. The famous Libyan Desert glass (LDG), the Darwin Glass, etc.

•Tektites. Possible origins, anomaious ages, especially the Australites.



Left- and right-handed versions of the amino acid alaine.

METEORITES

EXTRATERRESTRIAL HANDEDNESS

Human life forms favor right-handedness over left-handedness by a 9:1 ratio. Other terrestrial animáis are also asym- metrical in various ways. But on the molecular level, terrestrial biochemistry is all left-handed. As far as scientists can determine, only left-handed amino acids are incorporated into proteins. In non-life (if such a state really exists), amino-acid molecules are right- and left-handed in equal numbers-----as least this has been the theory up until now.

Amino acids are found in substances we as sume are non-life or of abiotic ori- gin In fact, amino acids are present in meteorites, often in substantial amounts. They are profuse in Australia's Murchi- son meteorite, a carbonaceous ehondrite. However, analysis of the Murchison's amino acids indicates that there are slightly more (7-9%) left-handed than right-handed amino acids present.

This extraterrestrial handedness is of great import to both cosmologists and biologists, because the carbonaceous chondrites are thought to have formed 4.5 billion years ago—long before life on earth originated. Furthermore, some of the Murchison's amino acids have never been found in terrestrial life, and they are also slightly left-handed.
For some unfathomed reason, Chemical and biological evolution both tilt to the left!

(Bada, JeffreyL.; "Extraterrestrial Handedness?" Science, 275:942, 1997. Cronin, John R., and Pizzarello, Sandra; "Enantiomeric Excesses in Meteoritic Amino Acids," Science, 275:951, 1997. Also: Peterson, I.; "Left-Handed Excess in Meteorite Molecules," Science News, 151:118, 1997. Note that left-handed amínn acids in the Murchison meteorite were also reported in the early 1980s:

Kerr, Richard A.; "Odd Amino Acids in a Meteorite," Science, 216:972, 1982)

Comments ■ This discovery of a tilted universe means that we cannot confirm Martian life with spacecraft instruments that test for an excess of left-handed amino acids.

Human philosophers, from the ancient Greeks to the present, like to think the universe is in balance, that equality reigns, yin and yang, and similar pre- sumptions. But, let's face it: our particular universe is lopsided. Of course, our universe may be balanced by another one far away, where everything, includ- ing its intelligent life forms, are made from right-handed amino acids—chemi- cally speaking, a rnirror image of our universe. Balance could thus be pre- served at that scale.

WHY DID LIFE TAKE A LEFT TORN?

Life-as-we-know-it is left-handed; that is, our amino acid molecules are levo- rotatory rather than the mirror-image dextrorotatory versions. Because humans "expect" symmetry in nature, it is taken for granted that everything else in the universe is split equally between left- and right-handed molecules. Earth life is just a fluke—or is it?

On September 28, 1969, organic-rich stones fell in Victoria, Australia. This was the Murchison meteorite, and it may carry a message. Over a decade ago, M.H. Engel and B. Nagy reported that the organic molecules in the Murchison meteorite were not split 50:50 between left- and right-handed versions. So contrary to expectations was this finding that most scientists assumed that the analysis was contaminated by terrestrial organic molecules. Now, M.H. Engel and S.A. Macko have refined the analytical techniques and apparently avoided any taint of contamination. Their conclusión: the Murchison amino acids still lean to the left.

From aH this arise several intriguing possibilities:

(1) Life on earth started split evenly between left- and right-handed amino acids, but was nudged to the left by the influx of organic-laden meteorites like the Murchison.

(2) Terrestrial life actuaHy originated elsewhere in the universe where much matter is left-handed, including life, if it exists there. In other words, our philosophical expectation of symmetry in the universe-as-a-whole is incorrect.

(3) The universe on the average is evenly split between left- and right- handed molecules, but there are "islands" or "pockets" which are left- or right- handed. Earth life is one of these "islands ."

(4) Given the chance, amino acids and other organic molecules would exist evenly split, but physical phenomena, such as circularly polarized light, tip the scales—to the left, in the case of terrestrial life. But that would mean that some physical phenomena are not symmetrical!

(Engel, M.H., and Macko, S.A.; "Iso- topic Evidence for Extraterrestrial Non- racemic Amino Acids in the Murchison Meteorite," Nature, 389:265, 1997. Also: Chyba, Christopher F.; "A Left-Handed Solar System," Nature, 389:234, 1997)

Comment. The references above state that terrestrial life is almost exclusively left-handed. Are there reaHy right- handed organic molecules in terrestrial life forms? Where?

LIFE FORMS IN METEORITES?

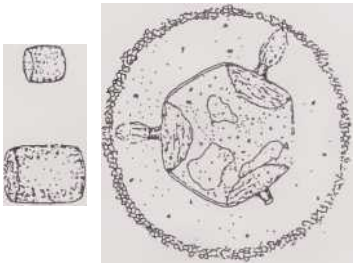
Few could have escaped the recent gushy press coverage of NASA's an- nouncement that an Antarctic meteorite, possibly of Martian origin, seems to have carried vestiges of life forms from that planet to ours. No need to recapitúlate all that hype.

What we do add is the observation that this same sort of excitement has swept through the scientifíc community at least twice before. Back in 1961, B. Nagy et al discovered tiny particles

resembling fossil algae in carbonaceous chondrites. They called these partióles "organized elements." Ultimately, these curious partióles were explained as natural crystals and terrestrial contaminante. (Ref 1.)

Much earlier, in 1881, Hahn, an eminent Germán geologist, asserted that he had examined thin sections cut from chondrites and found fossils of sponges, coráis, and crinoids. In fact, the extra-terrestrial coral that Hahn found even received the scientific ñame Hahnia meteoritica! In the end, though, Hahn's meteoric life forms met the same fate as the "organized elements" of Nagy et al. (Ref. 2)

(Ref. 1. ürey, Harold C.; "Biological Materials in Meteorites: A Review," Science, 151:157, 1966. Ref. 2. Bingham, Francis; "The Discovery of Organic Re- mains in Meteoritic Stones," Popular Science Monthly, 20:83, 1881)



Some of the "organized elements" found in carbonaceous chondrites in the early 1960s. They turned out to be terrestrial contaminants.

BLASTING ROCKS OFF PLANETS

> Can rocks from the surface of a major planet or satellite be launched into interplanetary space by natural processes? A few years ago the answer to this question would have been a resounding "no" from the ex- perts on both volcanism and impact cratering, the only geological processes known to eject solid material at substantial velocities. Observation, however, has once again confounded expectation.

In the snowy wastes of Antárctica, scientists have picked up meteorites that almost certainly carne from the moon and Mars. And near St. Gallen, Switzer- land, there was discovered a 22-centi- meter block of Malm limestone that was apparently ejected from the Ries impact cráter, almost 200 kilometers away, about 15 million years ago. We know all of these rocks are impact debris because they contain shatter cones indicating a violent origin.

Not only did these bits of debris confound expectations, but tlieir shatter cones implied shock-wave pressures far too low to achieve lunar and Martian escape velocities, or even the velocity necessary to propel that chunk of Malm limestone 200 kilometers. Something was wrong somewhere.

It has turned out that shock-wave theory had been misapplied. It is not the pressure that is important in ejec- ting bits of debris from around the impact site, but rather it is the pressure gradient. Anomaly extirpated!

(Melosh, H.J.; "Blasting Rocks Off Planets," Nature, 363:498, 1993)

Moral. A.C. Clarke was right again: When a respected scientist says something eannot happen, it probably will!

A METEORITIC EVENT LAYER IN ANTARCTIC ICE

> Where the East Antaretic icesheet meets the Transantarctic Mountains, oíd, deep glacial ice is tilted upward and exposed. Within this visible cross section of the icesheet, layers of dark volcanic tephra serve as stratigraphic markers and datable age horizons. Systematic sampling of these layers at a well-known meteorite collection site (the Alian Hills Main Icefield) has revealed a band consisting of unusually dark and rounded partióles, many of which are spheroidal. This debris layer (BIT-58) extends parallel to the stratigraphy of the ice established from the tephra bands, and thus apparently marks a' single depositional event. Several kilograms of ice from two sites along this band were subsequently collected and melt- ed, yielding a few grams of sediment for further study.

Microscopio examination and micro-probé analysis led to the following conclusions:

> Although direct evidence of an extra-terrestrial origin for this debris layer (such as the presence of cosmogenic ■^Be and ^®A1) has not yet been obtained, the available data strongly suggest that this sediment originated as meteoritic spallation debris. This debris is distinct from other Antaretic "cosmic dust" collections by virtue of its uniform, recognizable, ordinary chondrite composition and the consis- tent relation shown between grain size and texture. The BIT-58 layer probably originated from a single transient event, the passage and/or impact of a single lar ge meteorite over the East Antaretic icesheet.

(Harvey, R.P. et al; "A Meteoritic Event Layer in Antaretic Ice," Meteori- tics, 30:517, 1995)

Comment. The Petrozavodsk Phenomenon on p. 74 might well have left a layer like this. The 1908 Tunguska Event (Siberian Meteor) undoubtedly did.
(pp. 74, 174-175)

ALH 84001: A MESSAGE FROM MARS------- OR PERHAPS SOME OTHER PLANET

ALH 84001 is a meteorite picked up in the Alian Hills of Antárctica a decade ago. Its composition and fused crust suggest an extraterrestrial origin------ probably Mars. Space scientists think ALH 84001 was blasted off the Martian surface by an impacting body 14-18 million years ago, based upon its ex- posure to cosmic rays while circling the sun, edging ever closer to earth.

The composition of ALH 84001 tells us curious faets about its place of origin- First, it contains carbonate miner- als deposited by water. Second, the carbonate grains are banded, implying the parent rock formation was washed by water more than once. Third, and most Ínteresting, chemists have found traces of molecules called PAHs, based on interconnected benzene rings. Three sources have been proposed for these PAHs:

- •Terrestrial contamination
- •Prebiotic activity on the planet of origin
- •PAH-bearing comets and/or asteroids impacting the parent planet.

Terrestrial contamination has always been a problem in analyzing meteorites, but great care has been taken in recent years, especially with the Antaretic lode of meteorites. In view of these precautions, it seems rather likely that somewhere "out there" life is brewing.

(Anonymous; "A Chip Off the Oíd Mars," Sky and Telescope, 90:12, July 1995)

BIOGENIC MAGNETITE IN ALH84001

Many scientists were justifiably skeptical about those tiny, worm-like shapes seen in Martian meteorite ALH84001. Said to be fossilized bacteria, the objeets seemed much too small to be viable. Some experts suggested they were just abiotic crystal- line growths. K.L. Thomas-Keprta, who led the NASA team studying ALH84001, snorted that her group was not so stupid that it would mistake crystals for fossils.

Thomas-Keprta et al have now come forward with more evidence that ALH- 84001 does indeed contain biogenic material. Those worm-like forms have iron-rich rims containing fine-grained crystals of magnetite, some of which possess a unique morphology and which are essentially. identical to the magnetite crystals secreted by magnetotactic bacteria on earth. Their conclusión:

> In ALH84001, the presence of these elongated prismatic magnetite crystals embedded within the carbonate globules, which clearly formed on Mars, representa strong evidence for life on early Mars.

(Thomas-Keprta, Kathie L., et al; "Biogenic Magnetite within Martian Meteorite ALH84001," Eos, 80:F69; 1999)

SPEAKING OF ALH 84001

Among the various magnetic grains eom-prising ALH 84001 are some nanometer-sized, hexagonal prisms that are "indis-tinguishable" from those excreted by terrestrial magnetotactic bacteria.

Just when scientists in general were convineed that ALH 84001's "worms" had a mineralogical (i.e., non-biological) origin, along comes this revelation. The ALII-84001 controversy is not over yet.

(Kerr, Richard A.; "Tiny Magnets Point to Martian Life," Science, 290:2242. 2000)

Comment. In terrestrial magnetotactic bacteria, these magnetic crystals are strung together to make a sort of com- pass needle that helps orient the organ- ism in muck and other lightless and lowly habitats.

EETA 79001: EVIDENCE OF LIFE ON MARS?

The final issue of New Scientist for 1996 carried an article entitled "Death Knell for Martian Life." Was all that media hype for naught? What will NASA do now? Wait! Another putative Martian rock may save the day.

Picked up in Antárctica in 1974, meteorite EETA 79001 weighs 7.9 kilo- grams and is superficially unimpressive. Inside, though, researchers I.P. Wright and C. T. Pillinger found a surprising quantity of organic compounds-----actually 1-5 parta per thousand by masa. Thia fraction ia ao large that terreatrial con- tamination seema remóte. Furthermore, the organic component containa 4% more carbon-12 (relative to carbon-13) than the adjacent carbonate minerala. Thia ia atrong evidence that the orgánica had a biologieal origin. Similar teata on the media-hyped Martian meteorite ALH 84001 yielded the aame carbón ratioa. Pillinger remarked:

> **Theae reaulta offer the.atrongeat suppoxt yet for the hypothesis that life once exiated on the planet.**

So far ao good, but EETA 79001 con- veya two additional faets-----both very tantalizing:

(1) ThÍ8 meteorite waa blaated off the Martian aurface only about 500,000 yeara ago; and

(2)It probably carne from a different hemiaphere than ALH 84001.

From all thia, a aomewhat ahaky con- clusión: Life on Mar8 exiated not only recently (and perhaps is still present) but was (or is) widespread on the planet!

(Anonymous; "Life on Mars: Part Two," Sky and Telescope, 93:12, January 1997. Anonymous; "More Evidence for Martian Life," Astronomy, 25:26, February 1997)

MISSING MARTIAN METEORITES

Seientists scouring the Antarctic snowy wastes have collected 13 so-called SNC meteorites, which by virtue of their com- positions are likely from Mars. These tiny chunks are believed to have been blaated off the Martian aurface by five or six impacts of much larger meteorites. All save one of theBe Martian meteorites have formation ages of about 1.3 billion years.

The only part of the Martian surface believed to be 1.3 billion years oíd is the TMOM (Tharsis Montes and Olympus Mona) región. The rest of Mars--------about 90% of it—is much older. To have 12/13ths. of the Martian meteorites origínate from l/10th. of the planet's surface is highly unlikely. Something is Wrong somewhere; probably a bad assumption.

And what about that 13th. meteorite that did not get ejected from the TMOM región? Thia is ALH 84001, the contro- versial meteorite that contains strange worm-like structures resembling terrestrial bacteria. (See pp. 154, 171.)

(Taylor, Richard L.S., and Mittlefehldt, David W.; "Missing Martian Meteorites," Science, 290:273, 2000)

FOSSIL METEORITES

Over a century ago, astronomer H.W.M. Olbers (of Olbers Paradox fame) remarked that meteorites are extremely rare in the fossil record. While meteorites are found in profusión in some specially favored surface deposits (Antárctica and Austra- lia's Nullarbor Plain), there are very few records of any being found in the immense volumes of coal, gold ores, and other geológica! materials that have been mined down the centuries. Of course, many meteorites escaped the notice of miners who were looking for something else. Nevertheless, few have been reported from strata more than a few thousand years oíd. (See ESI8 in Neglected Geo- logical Anomalies.)

It is therefore surprising that a veri- table lode of fossil meteorites has been found in a limestone quarry at Kinnekulle, in Southern Sweden.

> **During the sawing of a few thousand cubic meters of Ordovician limestone into 2-3 cm thick slices, 25 fossil meteorites have been found. All meteorites, except, four, have been found in a 60 cm thick bed called the Arch- aeologist. This bed represente a few hundred thousand years and contains several hard ground sur faces.. .Many of the Archaeologist meteorites are prominently angular in shape whereas others are round. This seems difficult to reconcile with an atmospheric break- up of a single large meteorite.**

B. Schmitz and M. Tassinari, the authors of this paper, suggest that this rare concentration of fossil meteorites representa an unusual event in the solar- system history, possibly a major collision in the asteroid belt.

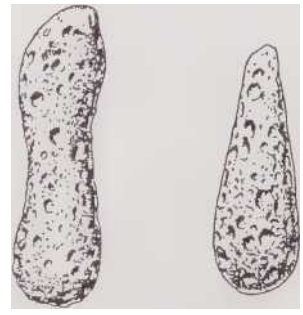
(Schmitz, Birger, and Tassinari, Mario; "Early Ordovician Meteorites: How Many Falls?" Eos, 79:F50, 1998)

Comment ■ It should be added that tektites and microtektites (impact debris) are like- wise found mainly in recent, superficial deposits, even though many ancient impact craters are now recognized on earth.

TEKTITES

TEKTITE MYSTERIES

Tektites are small glassy bodies found strewn on and near the surface in several regions of the world. They come in vari- ous shapes: droplets, buttons, even dumbbells. By general agreement, tektites are attributed to meteoric or cometary impacts that melt terrestrial rocks and splash liquid droplets into the atmo- sphere. There they are shaped by aero- dynamic forcea and solidify. This sce- nario is all very reasonable, but some nagging problems remain.



Dumbbell- and teardrop-shaped tektites picked up in Indochina.

Where-o-where is that cráter? 770,000 years ago, a huge meteor hit somewhere on earth and strewed an immense batch of tektites and microtektites over fully 10% of our planet's surface (about 5 x 10? square kilometers). This is called the "Australasian strewn fleld." Such a recent cataclysm must have left a large and inescapable cráter somewhere. The problem is that no one has yet found it. (Ref. 1)

Many lines of evidence suggest that the missing cráter is in Indochina. C.C. Schnetzler and J.F. McHone located four likely structures in Laos from Landsat images. However, visits to these areas found no evidence of an impact. (Ref. 2) So, this mystery persists.

How were the Muong Nong tektites formed? Muong Nong tektites are un- usually large (up to 24 kilograms), layered tektites. They are found in an area 1,000 kilometers in extent from Hainan iBland to Southern Indochina. Their large sizes imply that they are probably cióse to the missing cráter mentioned above. Still unresolved is whether they were originally puddles of molten rock near the elusive cráter or local ejecta analogous to volcanic bombs. (Ref. 1)

Is the "age paradox" flnally resolved? Some Australian geologists have strati- graphically dated the Australasian tektites as being just a few thousand rather than 770,000 years oíd. (vol. 1, p. 223) The 770,000-year figure is derived from the presence of Australasian microtektites at the Brunhes-Matuyama magnetic reversal and is, therefore, a "magneto- stratigraphic" date. Recent excavations

by now seem to confirm R. Fudali's assessment that all tektites and micro-tektites in the Australasian strewn fleld are definitely 770,000 years oíd. (Ref. 3)

(Ref. 1. Taylor, S.R.; "Tektites: Some' Unresvolved Problems," Meteorities and Planetary Science, 32:4, 1997. Ref. 2. Schnetzler, C.C. and McHone, J.F.; "Source of Australasian Tektites: Inves- tigating Possible Impact Sites in Laos," Meteorities and Planetary Science, 31:73, 1996. Ref. 3. Fudali, R.; "The Strati- graphic Age of Australites Revisited," Meteorities, 28:114, 1993)

Comment. Still puzzling is why so many Australasian tektites show up in receñí sediments. One theory is that humans valued these glassy objeets and did some anthropomorphic strewing.

IMPACT GLASSES

FLOTSAM ON THE GREAT SAND SEA

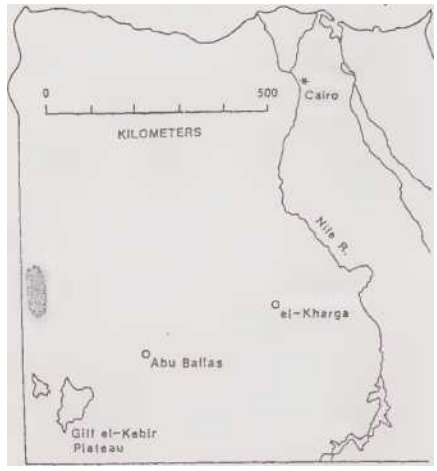
One of the strangest mysteries nestled among the giant dunes of the Egyptian Sahara was not recognized by modern scientists until 1932. In Deeember of that year, P. Clayton, a surveyor for the Egyptian Geological Survey, was driving among the dunes near the Saad Plateau when he heard his tires crunch on something that wasn't sand. It turned out to be large pieces of mar-velously clear yellow-green glass----- not just any glass but ultra-pure glass, 98% silica. As often the case, Clayton was not the first to come across the now-famous Libyan Desert Glass or LDG. Prehistorie humans had made knives and other sharp-edged tools from it; the ancient Egyptians had carved a scarab from LDG and deposited it in Tutan- khamen's tomb. But Clayton and the ancients did not recognize the scientifíc implications of their discovery.

LDG is the purest natural silica glass ever found. Over a thousand tons of it are strewn across hundreds of kilometers of bleak desert. Some of the chunks weigh 26 kilograms, but most LDG existe in smaller, angular pieces looking like shards left when a giant green bottle was smashed by eolossal forces.

Puré as it is, LDG does eontain tiny bubbles, white wisps, and inky black swirls. The whitish inclusions consist of refractory minerals, such as cristobalite. The ink-like swirls, though, are rich in iridium, which is diagnostic of an extraterrestrial impact — meteorite or comet. The iridium leads to the heart of the LDG problem: Where did this immense amount of widely dis- persed glass shards come from? Was it really created during the searing, sand-melting impact of a cosmic pro- jectile? This is how today's catastro- phists would have it?

At least three "minor" problems bedevil the accepted impact theory.

(1) The sur face of the Great Sand Sea shows no sign of a giant cráter. Neither do microwave probes deep into the sand by satellite radar.



LDG is strewn over the shaded orea in western Egypt.

(2) LDG seems too puré to be de- rived from a messy cosmic collision. Known impact craters, such as that at Wabar in Saudi Arabia, are littered with bits of iron and other meteorite debris. Not so at the LDG sites.

(3) LDG is concentrated in two areas. One is oval-shaped; the other is a circular ring 6 kilometers wide and 21 kilometers in diameter. The ring's wide center is devoid of LDG.

Could there have been a "soft" projectile impact; that is the detonation of a meteorite, perhaps 30 meters in diameter, 10 kilometers or so above the Great Sand Sea? The searing blast of hot air might have melted the sand be- neath. Such a craterless impact is thought to have occurred in the 1908 Tunguska Event in Siberia. Another theory has a meteorite glancing off the desert surface leaving a glassy crust and a shallow cráter that was soon filled in. But there are two known areas of LDG. Were there two cosmic proyectiles in tándem?

As of 1999, the origin of the beauti- ful green LDG rematas an enigma. And of course deserts are dynamic places. How much additional LDG lurks beneath all that blowing sand?

(Wright, Giles; "The Riddle of the Sands," New Scientist, p. 42, Julv 10, 1999)

Comment. In Tasmania, near Mount Darwin, is strewn the so-called Darwin Glass, which may be a distant relative of the LDG. Darwin Glass, however, exists in much smaller pieces and is strewn ta a splatter pattern. A poten- tial cráter is nearby. For details on these natural glasses, see ESM2 ta Neglected Geological Anomalies and vol. 1, p. 221.

TARGET: AUSTRALIA

Australia is strewn with at least three varieties of natural glass. AH seem to betoken severe thermal events ta the atmosphere that left no obvious craters.

(1) Tektites. Small bits of fused glass, most only a centimeter or so ta size, which were strewn ta great numbers over much of Australasia about 700,000 years ago. (p. 195)

(2) Darwin Glass. Which is found near Mt. Darwin in Tasmania. Although the frothy, irregular pieces, weighing just a few grams each, are concentrated at Mt. Darwin they can be picked up scores of kilometers away. Darwin Glass does not resemble tektite glass ñor the impactite observed around confirmed meteor craters.

(3) Edeowie Glass. This glass is most common at two spots about 30 kilometers apart, both about 400 kilometers north of Adelaide, South Australia. At each location, the strewn field encompasses several square kilometers.

The so-called Edeowie Glass is most common around slightly elevated areas of hardened, reddish-brown sediments. Some of these outerops, which look like fire-baked mud, are several meters wide and contata large circular holes that the researchers believe mark the sites of former tree trunks. In rare cases, slabs of the glass have been found still attached to the under- lying sediments, which share the glass' Chemical composition.

Volcanos can be ruled out ta all three cases listed; ñor have any obvious craters been discerned. Another suggestion requires meteors or comets exploding ta the atmosphere just short of impact pro- ducing blasts of hot gases that sear and fuse the terrata below as well as uproot trees and cause general mayhem.

(Anonymous; "Desert Glass: Is It Baked Australia?" Science News, 160:331, 2001)

Comments. Of course, the Tunguska Event of 1908 comes to mtad immediately but no Tunguska Glass exists. We also recall those slabs of Libyan Desert Glass (LDG) (above); the eolossal air blasts of 1963 and 1978 (pp. 177-178); and those recent, curious "impaets of some- thing" in Spata and near the Honduras- Guatemal border. (p. 180)

EMBEDDED STRUCTURES

Rock matrices often endose fossils of great paleontological valué and crystals of astonishing beauty. Less popularized are the so-called "con- cre lons, which are accretion structures that often assume strange shapes and occur ín prodigious quantities.

•Fossils. Bone beds, anomalous assemblages of fossils, fossils in diffi- cult to explain positions.

•Crystals. Diamond anomalies, pseudomorphs, crystals of colossal size.

•Geocjes. Huge dimensions.

•Concretions. Complex, hard to-explain shapes, three-dimensional arrays of nearly identical structures.

Ostras Gigantes en Plena Cordillera. (From: El Comercio, February 28, 2001. Cr. R. Gabbert)

(Mayo, Raúl; "Descubren Fósiles de Ostras Gigantes en Plena Cordillera," El Comercio, February 28, 2001. Cr. R. Gabbert)

Comment. The article calis the fossils "oysterB" ("ostras"), but they look more like giant clams.

The high Andes boast some curious marine innuendoes. Lake Titicaca is freshened by melting snows but is said to support a species of seahorse and many fish with marine affínities. It drains into lakes that are highly saline.

FOSSILS

AN ANTARCTIC BONE BED

W. Zinsmeister was accustomed to scoff at the idea that the Age of Dinosaurs ended violently with the impact of a giant asteroid some 65 million years ago. He always asked: "Where's the layer of burnt and twisted dinosaur bones?" His certainty was shaken, however, when he began raapping fossil deposits on Sey- mour Island, Antárctica. He didn't find the dinosaur bones but rather a giant bed of fish bones at least 50 square kilo- meters in area. Some sort of catastrophe must have annihilated untold millions of fish. And guess what? This great bone bed was deposited directly on top of that layer of extraterrestrial iridium that marks the 65-million-year-old Cre- taceous-Tertiary boundary at many sites around the world.

(Hecht, Jeff; "The Island Where the Fish Had Their Chips," New Scientist, p. 16, November 11, 1995)

Cross reference. Bone beds of fish and other creatures are filed under ESB13- X2 in Anomalies in Geology.

THE KAROO: THE GREATEST VERTEBRATE GRAVEYARD

On p. 198, we mention. a vast bone bed consisting mainly of fish remains. Now, an exchange of letters in a creationist journal gives us the opportunity to pre- sent a few facts about a giant bone bed of terrestrial vertébrate fossils: the Karoo Supergroup of Southern Africa.

The point being discussed by the creationists is the source of the estima- ted 800 billion vertébrate fossils contain- ed in the Karoo deposits. Whence this astronomical number of mainly swamp-dweHing reptiles? And whence the im- mense volume of sandstones and shale that contatos their bones? The Génesis Flood model favored by creationists re- quires that all 800 billion animáis be drowned at the same time and swept into South Africa and fossilized, But, they ask themselves, could the entire earth ever have supported so many swarnp- lovtog reptiles at the same time? Is the Flood model threatened?

(Froede, Cari R., Jr.; "The Karoo and Other Fossil Graveyards: A Further Re- ply to Mr. Yake," Creation Research Society Quarterly, 32:199, 1996)

Comment A pertinent response by Bill Yake followed the above letter. It is reflected in the following paragraphs.

The figure of 800 billion fossils appears to several authoritative works, although concern is expressed about its magnitude and assumptions employed in calculating it. Once thing that is certato is that the Karoo deposits are immense and packed with bones. Even after decades of fossil collecttog, bones are still sticking out of the ground.

Composed mainly of sandstones and shales deposited in shallow water, the Karoo can be 20,000 feet thick. The fossil-rich beds stretch out for hundreds of miles. Nowhere else on the planet is there such a massive, continuous, fossili- ferous land deposit. The creationists' questions are not out of order at all.
See Chapter ESD in Neglected Geological Anomalies for more along this line.

REALEY HIGH OYSTERS

At 12,300 feet of altitude among the coid rarefied peaks of the Andes, one would not expect giant fossilized oysters. But there they are-----over 500 of them to one location. Some are 3.5 meters in circum- ference (about 3.8 feet across). When alive, they probably weighed 300 kilo- grams (660 pounds).

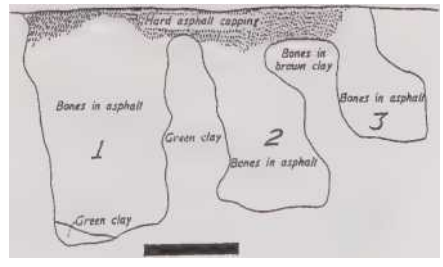
About 200 million years ago, accord- ing to the geologists, these oysters were thriving under Pacific waters. One must conclude that the Andes rose to their snowy magnificence in a very short period of geological time.

DEATH IN THE PITS

The bone contents of the La Brea Tar Pits, in Los Angeles, are routinely ex- plained by the "entrapment theory." Animáis were attracted to the water covering the tar pits, got stuck to the tar, and there died. No problem! Cer- tainly no anomalies! The theory sounds good, but W. Weston has reviewed the extensive literature and identifies some anomalies that undermine the entrapment theory.

First, the geometry of the La Brea "bone pockets" is curious (see figure) and their contents even more so.

One of the more unusual pockets was Pit 16. Only four feet wide with vertical sides, the pit went down 21 feet before it tapered three or more feet to the typical three-toch- wide chimney. Somehow numerous animáis tocluding dire wolves, saber-



Three La Brea bone pits. The bar is 16 feet long. These pits are crammed with the smashed and. jumbled bones of many species.

tooth cats, coyotes, camels, bison. horses, and even the bulky mastadon had managed to squeeze themselves into a hole not much wider than a bathtub.

The bones are well-preserved but mostly damaged physically. Most are broken, splintered, erushed, dismera- bered, and all mixed together in what Weston categorizes as a "chaotic inter- mingling."

He makes the interesting observation that the softer parts of the mammals and birds are totally missing.

Neither skin, hair, feathers, scales, claws, beaks, talons, or any internal organs have even been found in any of the tar pits. This absence is re- markable since, as previously men- tioned, the parts of insects have been preserved.

Weston notes two "statistical anoma- lies":

(1) A numerical preponderance of carnivores, which is opposite of what is observed in modern, analogous entrap- ment situations; and

(2) The preponderance of land birds (92%) over water birds (8%). One would expect dncks and geese to be attracted to the water-covered pits, instead, tur- key bones are eommon.

A single catastrophic flood seems a better answer to the contents of the La Brea bone pits—in Weston's view.

(Weston, William; "La Brea Tar Pits: An Introductory History (1769-1969)." Creation Research Society Quarterly, 38:174, 2002)

THE WHALE-ON-ITS-TAIL FOSSIL

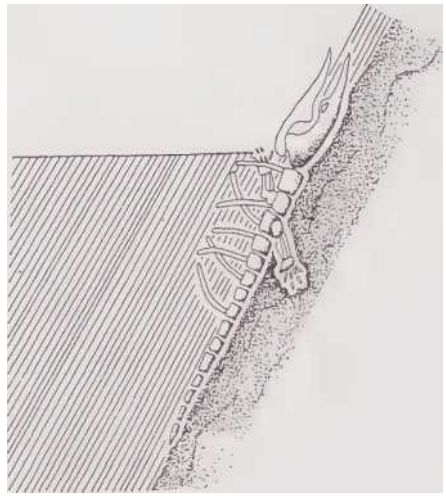
Near Lompoc, California, is a large de- posit of diatomaceous earth, so-called because it is composed almost entirely of countless billions of exquisitely sculp- tured diatom skeletons. Uniformitarian geologists have steadfastly maintained that such diatomaceous-earth deposita require miUions of years to form as the tiny skeletons sink slowly to the sea floor. At Lompoc, however, embedded in the thick layer of diatomaceous earth is the fossil of a large whale apparently standing on its tail. How could this whale fossil have maintained its position and integrity over hundreds of thou- sands of years as it was buried milli- meter by millimeter? Wouldn't the bones have been quickly scattered?

Creationists have pointed to this whale as proof that the Lompoc diatomaceous- earth deposit was formed cata- strophically, interring the whale almost instantaneously, and burying doctrinaire uniformitarianism at the same time. (Cre- ationists want to "shorten" geological time to flt Biblical schedules.)

But was the whale really entombed on its tail? Creationist geologists studied the Lompoc deposit and put a different slant on the story but not on its ending.

Contrary to some reports that have eirculated, the 80-90 ft (24-27 m) long fossilised baleen whale found in April 1976 in an inclined position in a diatomite unit in the Miguelito Mine at Lompoc, California, was not buried while 'standing on its tail'. An on- site investigation has revealed that the diatomite unit which entombed the whale is also inclined at the same angle, the whale having been buried in the diatomite unit while both were in the horizontal position, and subse- quent earth movements having tilted both. Nevertheless, this whale fossil still bears testimony to its catastrophic burial, and thus the catastrophic deposition of the enclosing diatomite .

The current uniformitarian (slow and gradual) model for diatomite deposition, as seen in the Guaymas Basin of the Gulf of California, is not capable of explaining the purity of the Lompoc diatomite.. .the deposition rate is too slow to avoid corro- sión and scavenging of the bones. both of which are absent from the Lompoc whale bones.



The Lompoc diatomite bone bed is to the left. The fossil whale is positioned as found when excavated in 1976.

(Snelling, Andrew A.; "The Whale Fossil in Diatomite, Lompoc, California," CEN Technical Journal, 9:244, 1995)

Comment. The Lompoc whale fossil does suggest very rapid deposition, but it does not prove that 4.5 billion years of geological history can be compressed into the requisite 6,000 years!

Qreen river blües

Creationists are ever on the lookout for anomalles that seem to undermine accep- ted geological dating schemes. In this connection, the Green River Formation in Wyoming is perhaps the most frustra- ting to them, because there the simple counting of strata Beems to emphatically demolish their "young-earth" model. In the Green River Formation, geologists find more than a million varve paire (thin layers) of shale stacked atop one another. Each varve is assumed to repre- sent a year's worth of lake sedimente.

The apparent upshot is that the Green River Formation completely and irrefu- tably trashes the 6000-year-old-earth model said to be required by Scripture. (Ref. 1)

All well and good for mainstream Science, except that the creationists have pointed out two odd things about the Green River Formation that challenge the mainstream interpretation. (Ref. 1)

We will cali these observations "anoma- lies," as is our wont.

Anomaly #1. Fossil catfish are found in exceUent states of preservation over an area of 16,000 square kilometers of this formation. Even skin and soft parts are fossilized. (Ref. 2) Such remarkable preservation hints at very rapid burial rather than slow annual sedimentation.

In fact, dead fish placed on a muddy marsh floor, protected from seávengers by wire cages, decay significantly in less than a week. (Ref. 3)

Anomaly #2. Near Kemmerer, WY, the Green River Formation displays two layers of volcanic ash, each 2-3 centi- meters thick. Each layer almost certainly represents an event that deposited ash over a wide area at about the same time. Yet, the two ash layers are separated by between 8.3 and 22.6 centimeters of shale layers. Varve counts between the ash beds vary from 1,160 to 1,568.

(Ref. 4) Thus is additiona! doubt cast upon varve counting as an accurate method of determining age, at least in the Green River Formation.

(Ref. 1. Garner, Paul; "Green River Blues," Creation/Ex Nihilo, 19:18, June- August 1997. (An Australian creationist publicatiou) Ref. 2. Buchheim, H.P., and Surdam, R.C.; "Fossil Catfish and the Depositional Environment of the Green River Formation, Wyoming," Ge o logy, 5:198, 1977. Ref. 3. Zangerl, R., and Richardson, E.S.; "The Paleoecolog- ical History of Two Pennsylvanian Black Shales," Fieldiana: Geology Memoirs, 4, 1963. Ref. 4. Buchheim, H.P., and Biaggi, R.; "Laminae Counts within a Synchronous Oil Shale Unit: A Challenge to the 'Varve' Concept," Geological Society of America, Abstracts, 20-.A317, 1988)

BUILDING A FIRE WITH WOOD 45 MILLION YEARS OLD!

It is commonly recognized that the Arctic was once a more benign place. Remember those "polar dinosaurs"? (vol. 1, p. 150) Well, within the Arctic Circle one finds still more-incongruous, more-difficult-to- explain remnants of those warmer days.

The most speetacular site in on Axel Heiberg Island in the Queen Elizabeth Islands of northeast Cañada at 80°N. For the past two decades hundreds of upright frozen trees with leaf litters and layers of low grade Ugnite coal in 20 or more vertical layers have been discovered. The paleoflora is excep- tionally well preserved and some of it is not petrified. There are trees up to one metre in diameter that can be cut with an axe and burned, yet the paleoflora is dated 'Eocene', about 45 million years ago in the uniformitarian time scale.

(Oard, Michael J.j "Coid Oxygen Isotope ValueB Add to the Mystery of Warm Cli- mate Wood in NE Cañada," TJ, 17:3, no. 1, 2003)

=

MUD SPRINGS REGURGITATE ANCIENT FOSSILS

Mud springs in Wiltshire, England, may be the only ones of their kind on the planet. The Wiltshire mud springs are coid. They are not hot and steaming like those seen where geothermal heat is cióse to the surface, as in New Zea- land, Java, and Yellowstone. They are also unique in their entrainment of subterranean fossils and bringing them to the surface.

> **There is no explanation of the way the springs ooze a palé, coid, grey mud to the surface, forming blisters that spurt high into the air.**
>
> **Neville Hollingworth of the Natural Environment Research Council said: "They are like a fossil conveyor belt bringing up ñnds from the clay lay- ers below and then washing them out in a nearby stream."**

The fossil conveyor belt yields bones of marine reptiles, oyster shells, and the remains of sea creatures that lived during the Jurassic, about 165 million years ago. Some of the bivalves still retain their organic ligaments.

Geologists wonder what forceé squeeze the mud to the surface like toothpaste from a tube.

(Nuttall, Nick; "Mud Springs a Surprise after 165 Million Years," London Times, May 2, 1996. Cr. A.C.A. Silk) '

CRYSTALS

D1AMONDS ARE AN ANOMALIST'S BEST FRIEND

The diamonds we mine today were, according to prevailing wisdom, formed about 3 billion years ago, at depths of 150-300 kilometers, where pressures of 725,000-1,000,000 psi are believed to exist. After lengthy cooling periods, the crystalized diamonds were trans- ported to the surface by fluid, lower- melting-point rocks, such as kimberlite. Many South African diamonds are mined from kimberlite pipes.

Diamonds are never puré carbón; they always contain some nitrogen and boron. Occasionally, they harbor tiny radioactive impurities; usually alpha- particle emitters in the uranium-238 decay chain. Alphas emitted by these impurities have well-defined energies and penétrate the diamond matrix only so far. If one examines a diamond with a high-power microscope (say, at 100 x), one can see concentric rings surrounding the impurities. These dark radiohalos or "pleochroic" halos have specific radii and can be used to identify the radio- isotopes that produced them. So far, so good; but:

> **The fact that fully formed, optically visible internal radiohalos in diamonds are now presented casts a considerable shadow over current theories of diamond génesis.**

Actually, the radiohalos pose three challenges to diamond-genesis theory.

Problem 1. The half-lives of the halo-creating radioisotopes are measured in thousands of years rather than the bil- lions prescribed for crystallization. In fact some of the half-lives are only minutes or days long. M.JI. Armitage com- ments:

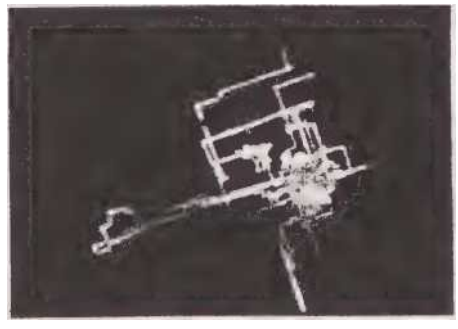
> **How could these halos become imprinted if the formative cooling processes involved require such lengthy intervals?**

Problem 2. The radioactive impurities producing the radiohalos are very tiny ----about 2-4 micrometers in diameter----- and are highly concentrated. Armitage continúes;

> **What is most difficult to understand is that many of these inclusions and impurities have much lower melting and boiling points than the diamonds in which they are found.**

Why did the impurities fail to disperse as the higher-melting-point diamond matrix surrounding them slowly cooled down the eons?

Problem 3. Some diamonds contain a strange, rectangular latticework of radiation-stained hollow tubes. Some of the tubes terminate in radiohalos; some do not. Some reach the crystal surface; most don't. What are these tubes and how could they retain their intricate structure during diamond génesis?



Photomicrograph (100 X) of hollow tubes found in a diamond.

(Armitage, Mark H.; "Internal Radio- halos in a Diamond," American Labora- tory, p. 28, December 1993. Cr. N. Ethridge.)

Comments. More on the radiohalo problem can be found in vol. 1, p. 213, and under ESP1 in Anomalies in Geology. Note, too, that creationists employ radiohalos to attempt to prove that the earth is really young. Finally, American Laboratory is one of the thousands of journals we have not examined. It is painfuUy obvious that, even with some 40,0 journal volumes reviewed, we have much farther to go!

A TRIPLE ANOMALY IN A DIAMOND

Diamonds as gems have an eerie hold on the human mind. Scientists, too, find them mysterious in several ways. Despite considerable study, the origin(s) of diamonds remain controversia!. Above, we already mentioned and illustrated the unusual orthogonal arrays of hollow tubes discerned in some diamonds at high magnifIcations (100X). These tubes remain unexplained, as far as we know.

Now, in some diamonds, these tubular arrays are found to be associated with radiohalos. Radiohalos are often seen in some common minerals, such as biotite, but, even there, questions of origin persist. (See vol. 1, p. 213.) No one questions that radiohalos, whether in biotite or diamonds, arise from the the decay of radioactive inclusions; that is, mineral specks carrying uranium, thorium, or some other radioactive ele- ment. But how did these radioactive specks get lodged inside the hollow tubes which themselves are encased within diamonds? The problem is that these specks have much lower melting points than the diamond matrix. Why wasn't the liquid radioactive material dispersed throughout the higher melting point diamond matrix long before the latter crystallized? The same question must be asked about the radiohalos themselves, because the application of heat quickly anneals and disperses them. Complicating the picture still further is the fact that some of the radiohalos arise from the decay of polonium-210, which has a half life of only 138 days.

The hollow tubes, the low-melting-point inclusions, and short-half-life radiohalos combine complícate the explanation of diamond origin(s) and geological history.

(Armitage, Mark; "Internal Radiohalos in a Diamond," Creation Ex Nihilo Teehnical Journal, 9:93, 1995. This creationist journal is published in Australia. The article is based mainly on: Mendelssohn, M.J. et al; "Internal Radioactive Haloes in Diamonds," Diamond Research, 17:2, 1979)

Comment. Explanations of the forgoing conundrums hypothesize the invasión of erystals by impurities after diamond solidification.

MIGHT DIAMONDS BE DEAD BACTERIA?

How can something as beautiful, puré, and crystalline as a diamond be made from dead, disgusting bacteria? In truth, all diamonds are full of impurities and curious microscopio structures. (See: "Diamonds Are an Anomalist's Best Friend" above.)

The main constituent of diamonds is carbón, but even chemically puré carbón is contaminated in a sense. The con- taminant is light carbón; that is, C“, which is an isotope used preferentially by living organisms. Some diamonds, it is found, contain anomalously large fractions of C^, which suggests they have an organic origin. Some diamonds also contain sulfide inclusions that have sulphur-isotope ratios also symptomatic of a biological origin.

The specific diamonds suspected to have an organic origin are the so-called "eelogitic" diamonds. These diamonds may have obtained their carbón and im-

purities from bacterial communities that once lived around hydrothermal vents that existed along ancient mid-ocean ridges. Subsequent metamorphism (heat and pressure) turned the masses of bacteria into eclogitic diamonds. So, those sparklers of yours may just be clumps of billion-year-old bacterial corpses!

(Nisbet, E.G., et al; "Can Diamonds Be Dead Bacteria?" Nature, 367:694, 1994)

Definition. Eclogites comprise a class of metamorphic roeks formed at extreme- ly high temperatures and pressures.

COPPER PSEUDOMORPHS

There are two places in the World where large masses of native (almost puré) copper are common: the Lake Superior región, particularly Isle Royale, and Corocoro, Bolivia. The largest "nugget" of nearly puré copper comes from Lake Superior and weighs almost 46 tons! But the Corocoro mines are rich in another way; copper "pseudomorphs." In copper- " pseudomorphs, copper ions insidiously invade crystals of other minerals and assume their shapes. Copper pseudo- morphs of aragonite, a form of $CaC0_3$, are common.

Aragonite sometimes occurs as short, hexagonal prisms. Under the water table, in copper-rich areas, copper ions in solu- tion "attack" aragonite crystals. First, they oust and replace the outer layers of $CaC0_3$, gilding the aragonite crystal with a thin layer of puré copper. Then, they work inwardly and eventually usurp the whole crystal and take on its shape.

Even stranger are those hexagonal crystals that are puré aragonite in the top half and puré copper in the bottom half. Mineralogists speculate that these formed along the edge of the water table.

(Hyrsl, Jaroslav, and Petrov, Alfred; "Pseudomorphs from Bolivia," Rocks and Minerals, 73:110, November/December 1998)

D'EMERAUDES EN FORME DE COQÜILLAGES

The mines of Columbia have yielded some immense emeralds ("émeraudes"); for example, Emilia (7,025 carats) and El Monstro (16,020 carats). These gems are amazingly large but not anomalous of course. However, Columbia's Matecana mine, long stripped of its most-valuable emeralds, now provides gem-fanciers with stones that qre more interesting than precious: specifically, emeralds in the shapes of shellfish ("coquillages"); gastropods to be a bit more specific.

. It seems that over the years the calcium carbonate of fossil seashells has been replaced by the mineral beryl, which, which also crystallizes as emer- als, aquamarines, and other less valuable gems. The resulting seashell-like emeralds are termed "pseudomorphs." These geological oddities are created whenever one mineral replaces another and takes on its shape. In the Matecana mine, the replaced shape is a fossil instead of another crystal.

(Augereau, Jean-Frangois; "Decouverte en Colombie d'Émeraudes en Forme de Coquillages," Le Monde, September 28, 2002. Cr. C. Maugé.)

Cross Reference. See above, where we describe copper pseudomorphs of the mineral aragonite.

SPOD LOGS

The Black Hills of the Dakotas are com- posed of Precambrian shists that have been intruded by granite. The Harley Park granite is well known to us all because it has been carved into the monumental visages of four presidents at Mount Rushmore. Nature, too, has expressed herself on a giant scale nearby.

> Around the granite, the shists are host to numerous spectacular pegma- tites. These were mined and quarried in the early years of this century for both the large sheets of mica and also the spoduoraene, which was a valuable source of lithium. The largest crystals were of the spoduomene, which were found up to 20 m [63 feet] long. Looking like great white tree trunks with two deavages along their length, they were affectionately known as spod logs.

(Waltham, Tony; "Spod Logs," Geology Today, 13:207, 1997)

Comment. Any crystal 63 feet long is worthy of mention in this newsletter!

GEODES

A BROBDINGNAGIAN GEODE

Any rock-and-mineral shop will happily sell you piece of a geode that has been sliced like a cantaloupe and nicely polished to reveal its beautiful crystal- line interior. You may have to pay hundreds of dollars for half of ,a melon- sized geode. if so, what is a geode 26
feet long worth----one that can shelter several people within its cavity?

Sueh a geode was just a rumor among rock collectors until recently, when J. Garcia-Guinea, a geologist from Madrid's National Museum of Natural Sciences, followed up the leads. Sure enough, some 4 kilometers from Almería, in north- eastern Spain, he found a veritable ^ crystal cave. Inside, the giant geode is lined with near- perfect, transparent crystals of gypsum, some of which are li feet long.

(Anonymous; "Giant Crystal Cave Dis- covered," BBC Homepage, June 12, 2000. Cr. D. Phelps. Holden, Constance; "Brobdingnagian Crystals," Science, 288:2127, 2000)

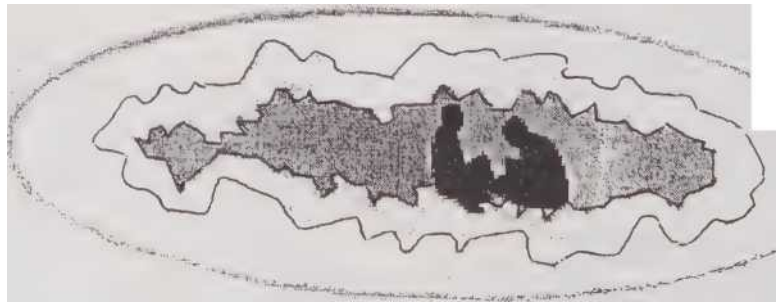
Comment ■ The Spanish geode merits headlines for its size, but geodes also offer grist to the anomalist. In particular, we refer to geodes found near Niota. Illinois, that are fílled with solid tar or liquid bitumen. When the latter are broken open, the petroleum squirts out violently. There are no oil deposits within 25 miles, so the presence of oil-filled, pressurized geodes is a puzzle. See ESA5 in Neglected Geological Anomalies.

CONCRETIONS

NATURAL STONE SPHERES

Whenever we see nearly perfectly wrought stone spheres in natural set- tings, we usually jump to the conclusión that they have been shaped by human hands. We assume that natural forces are too erratic to sculpt such neat geo- metrical solids. This stance is sometimes ju6tified, as confirmed by the hundreds of precisely executed stone spheres found in the jungles of Costa Rica. Nature herself, however, is often an expert craftswoman. Some concretions are beautificaily spherical, so are some spheres fashioned in volcanic calderas.
In Utah, though, southeast of Cleveland, in a formation called the Molen Reef, there are literally millions of stone sphéres of more mysterious origin. E. Hansen described these in a recent issue of the Ancient American.

> The spheres range in size from as small as a baseball to over 10 feet in diameter. The bigger ones are more perfectly round than smaller ex- amples. After a lifetime of trying to form a theory of how these were formed, I can only throw up my

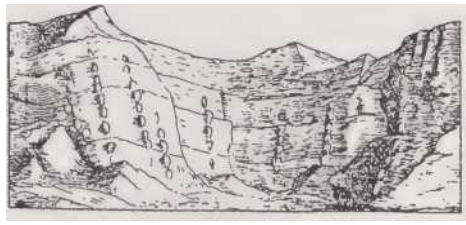


The Almería geode's cavity in large enough (8 x 1.7 meters) for humans to enter and examine it. Some of the gypsum crystals hning the inside walls are almost a half meter long.

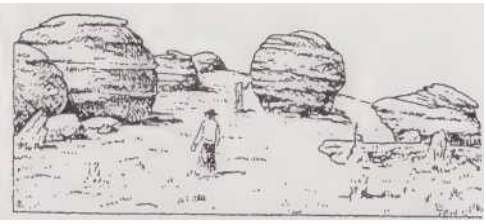
hands in surrender! They are clearly formed as mud on a lake bottom, because when two touch, one will in- dent the other, or both will be equally distorted. The mud simply hardened over time into sandstone.

(Hansen, Evan; "Stone Spheres o£ the American West," Ancient American, no. 29, p. 31, 1999)

Comment. Smaller lithiñed "mudballs" (usually under 1-foot diameter) have been reported frora many geological for- mations worldwide. (See ESA2-X3 in Neglected Geological Anomalies.) The Costa Rican human-fashioned stone spheres are cataloged in MS02 in our catalog Ancient Infrastructure.



Vertical Unes of flint concretions in challe cliffs near Norfolk, Bngland. Pre- sumably, a three-dimensional array continúes in the unexposed matrix behind the visible concretions. (From: Neglected Geological Anomalies)



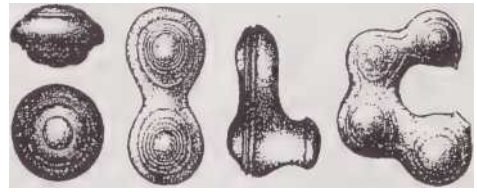
Large, calcareous, spheñeal concretions create a "rock city" in Kansas. (From: Neglected Geological Anomalies)

FROM NATÜRE'S ATELIER

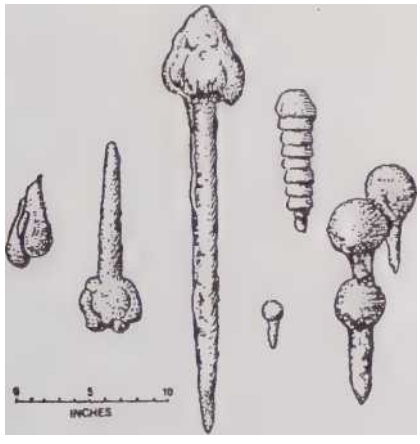
One of geology's more fascinating mys- teries concerns the formation of concretions. Concretions are structures within rock that differ in form and/or composi- tion from the matrix. Often, they form around an impurity of some so-rt, say, a tiny fossil. If concretions were all nicely spherical or crystalline in shape, we might be able to explain them as we do with the oyster's pearl and winter's snow- flake. ünfortunately for the theorists, concretions usually come in bizarre shapes----shapes an avant garde sculptor might appreciate. Not only do concretions come in weird geometries but they may be replicated in prodigious numbers, like the famous Kimmeridge "coal money." Additionally, some flint concretions are arrayed in thick chalk beds in amazingly regular three-dimensional arrays that tax the ingenuity of any theorist.

To illustrate the extremes of nature's inorganic-chemical imagination, we now provide some illustrations from a recent two-part article in Rocks & Minerals and one of our catalog volumes.

(Dietrich, R.V.; "Carbonate Concretions," Rocks *k* Minerals, 74:266 and 74:335, 1999. ESA3 in Neglected Geological Anomalies)



Carbonaceous concretions ("imatra stones") from Finland. Virtually identical concretions occur in the Connecticut River Valley.



Mace-shaped sand concretions from Mt. Signal Tower, California. The longest measures 28 inches.

PHENOMENA OF CATASTROPHIES

CATASTROPHISM IN GENERAL

THE AGE OF FIRE AND GRAVEL

Back in 1883, I. Donnelly wrote his seminal Ragnarok, to which he attached as a subtitle: The Age of Fire and Gra- vel. He hypothesized that all those sheets of unconsolidated rocky debris strewn across the planet—called the "drift"-----were the consequence of impaets of comets. But in Donnelly's day, all geologists were uniformitarians and wedded to glacial theory. Donnelly's "age of fire and gravel" was really a succession of Ice Ages. Quite a differ- ence in mechanism!

Glacial theory, however, has diffi- culty in explaining apparent glaciations during periods when the earth was sup- posed to be very warm. Ñor does it account easily for glacial-like debris in equatorial regions.

With the current ascendancy of "impact geology," some brave geologists are reinterpreting supposed glacial deposita in terms of sheets of ballistic ejecta from the impaets of comets and/or asteroids. Modern estimates of terrestrial cratering suggest that 10% of our plan- et's surface could be covered by 10+ meters of ejecta, and 2% by 200+ meters. Now that's a lot of ejecta!

(Rampino, Michael R.; "Tillites, Diamictites, and Ballistic Ejecta of Large Impaets," Journal of Geology, 102:439, 1994)

Comment. The Ice Ages won't be melted completely away by such reinterpretations. Ñor will I. Donnelly ever get any credit for his research and visión. But we are making progresa.

RAGNAROK: THE AGE OF FIRE AND GRAVEL

We have again purloined the tifie of I. Donnelly's 1883 book in which he proposed that a great comet had struck the earth in ancient times causing much environmental mayhem. Donnelly had mined the infant Library of Congress while he served three terms as Minne- sota's representative in Congress. His collection of myths, legends, and geological anomalies was one of the first books to be based upon Fortean-type research.

We couldn't resist this brief salute to this pioneer anomalist. More to the point here is "Ragnarok," the "day of doom" in Seandlnavian mythology. While a miniature Ragnarok may have occurred early in human history, as hypothesized by Donnelly (and many others later), this relatively recent event paled in comparison to the disaster that engulfed the

planet 65 million years ago at the Cretaceous-Tertiary Boundary (KTB).

It has been drummed into us by the media and supported by a seientific consensus that the KT event was entirely the consequence of an asteroid smashing into the Yucatán blasting out the now- buried cráter called Chicxulub and, of course, deep-sixing the dinosaur clan,
This story is too neat and simple; the real KT event was messy and quite difíerent from what you have been told,

Was there really only a single impact, and was Chicxulub big enough to ac- count for the global Ragnarok that ensued? We list a few facts that challenge the official KT scenario.

•Geologists observe that the KTB, a deposit of clay, carbón, shocked quartz, microtektítes, and other debris, is actu- ally a double layer. Furthermore, it en- compasses the globe save for Antárctica.

•Global soot, like the KTB debris layers, is abundant evidence of a fire that consuméd virtually everything flamen able. Chicxulub was too small to ignite the entire planet.

•Similarly, the dust raised by the Chicxulub impact has now been shown to be far from sufficient to create the postulated "nuclear winter" that is claimed to have killed off 70% of the world's species.

•The Chicxulub collision was likewise too weak to have caused the massive contemporaneous outpouring of lava in India called the Deccan Traps. These lava flows were another component of the KT Ragnarok.

These are just a few of the observations suggesting the Chicxulub was assisted by other impaets, perhaps not simultaneous in time, but cumulative over a period of perhaps thousands of years athwart the official 65 million-year date of the KT event.

There is in fact a global set of great cráters that are dated circa 65 million years. They are: the long-suspected Manson Cráter (Iowa) ; Kara (Siberia) ; Kamensk, Gusev, and a giant Pacific Ocean splash-down (suggested, we sup- pose, by datable tsunami debris).

Even the moon adds some supporting evidence for a series of KT impaets. Several of the big lunar craters also seem to be of KT age.

Whence all the cosmic projectiles entering earth-moon space in KT time? T. Van Flandern theorizes that they carne from an exploded planet.

(Van Flandern, Tom; "What Really Hap- pened at the K/T Extinction Event?" Meta Research Bulletin, 11:1, March 15, 2002)

Cross reference. See p. 175 for further discus sions on the culpability of Chicxulub for the KTB event.

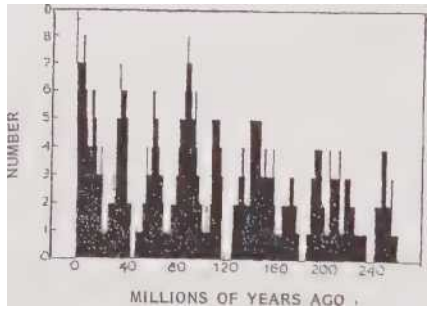
WHENCE THE EARTH'S PULSE?

Geological history records a restless planet subject to a suecession of Chemical and physical upheavals. Have these great paroxysms been random in time? M.R. Rampino and K. Caldeira do not thirik so:

> Published data sets of major geología events of the past ** 250 Myr (extinction events, sea-level lows, continental flood-basalt eruptions, mountain-building events, abrupt changes in sea-floor spreading, ocean-anoxic and blackshale events and the largest evaporite deposits) have been synthesized (with estima- ted errors). These events show evidence for a statistically significant periodic component with an underly- ing periodicity, formally equal to 26.6 Myr, and a recent máximum, cióse to the present time. The eyele may not be strictly periodic, but a periodicity of ~ 30 Myr is robust to probable errors in dating of the geo- logic events.

The obvious question is: What could cause a 30-million-year periodicity? Inter nally, the earth's innards might be periodic, possibly in terms of plume eruption, mineral phase changes, core convection, etc. Externally, comets and asteroids are cyclic. Rampino and Caldeira point out that the solar system erosses the heavily populated plañe of the Galaxy every 30 million years.

(Rampino, Michael R., and Caldeira, Ken; "Major Episodes of Geologic Change Correlations, Time Structure and Pos- sible Causes," Earth and Planetary Science Letters, 114:215, 1993)



Number of geologic events that have occurred during the eons. Note the possible cyclicity.

THE TUNGUSKA EVENT

ANOMALOUS PHENOMENA ASSOCIATED WITH THE 1908 TUNGUSKA EVENT

N.V. Vasilyev has prepared a lengthy review of the 1908 Tunguska "event," which is usually ascribed to a wayward comet or meteorite. Vasilyev's data is based upon 167 reporte, mostly in Rus- sian. They show once again that this was no ordinary impact event, as illus- trated by the following observations:

(1) A "local" magnetic storm began about 6 minutes after the explosión (If that is what it really was.) and lasted for more than 4 hours. These magnetic perturbations resembled those following nuclear atmospheric explosione.

(2) The Tunguska object left no smoky trail like many fireballs, but rather irridescent bands that looked like a rainbow.

(3) Following the "explosión," at least part of the object continued on in the same direction but veered upwards. [Meteors sometimes skip out of the atmo- sphere on trajectories like this.]

(4) Although the Tunguska event occurred on June 30, 1908, optical anom- alies appeared all across northern Europe as early as June 23. These included mesospheric, silvery clouds, very bright nights, colorful twilight afterglows [something like those following the Krakatoa eruption], and remarkably intense and long-lasting solar halos. Some of these effeets persisted until late July.

(5) Neither craters ñor raeteoric debris have been discovered so far, despite assiduous searches.

(6) The explosión created a shock wave that leveled 2150 km^ of taiga and a flash that singed about 200 km .

(Vasilyev, N.V.; "The Tunguska Meteorite: A Dead-Lock or the Start of a New Stage of Inquiry?" RIAP Bulletin, 1;3, nos. 3-4, July-December 1994, and 2:1, no. 1, January-March 1995. RIAP = Research Institute on Anomalous Phe- nomena.)

FLANK COLLAPSES AND LANDSLIDES

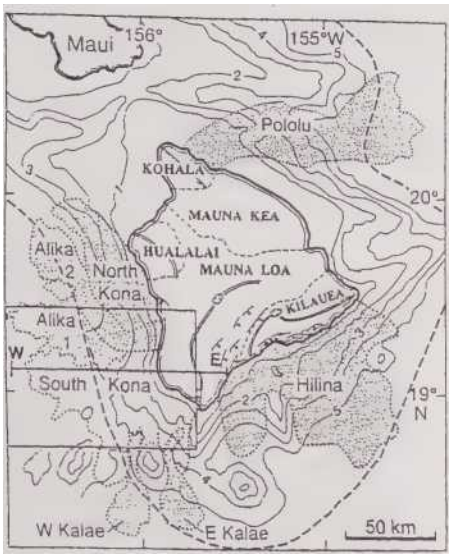
THE GIANT LANDSLIDES OF HAWAII

Most landslides are not anomalous, but some of those that occurred on the flanks of the Hawaiian Islands are so immense that anomalists should at least take note of them.

J. Moore et al have been mapping and sampling huge blocks of rock that slid off the sides of Mauna Loa in the so-called South Kona landslide. These blocks of lava and basalt are truly giants. One was measured at 10 kilo- meters in length, 300 meters in thickness. Some of these colossal chunks of rock slid 80 kilometers (50 miles) out to sea during the late Pleistocene. Imagine the tsunami (tidal wave) this landslide must have generated!

(Moore, James G., et al; "Giant Blocks in the South Kona Landslide, Hawaii," Geology, 23:125, 1995)

Comment. The South Kona landslide, or one like it, and the resulting tsunami might account for the curious distribu- tion of sand dunes along the eoast of New South Wales, Australia. (See vol. 1, p. 227.)



The island of Hawaii. The offshore stip- pled areas show the major submarine landslides. Application of the. distance scale proves their immense areal extents. Depth contours are in kilometers! The heavy dashed Une marks the axis of the Hawaiian Deep.

**THE HILINA SLUMP A.K.A.
"THE BIG CRACK"**

Huge chunks of the Hawaiian Islands have been sliding into the Pacific Ocean for hundreds of thousands of years. (above) Geologists classify these Elides as either "slumps" or "debris ava- lanches." Slumps move just a few inches a year but are prone to bigger, jerky adjustments. Debris avalanches are fast cascades of rocks and soil. In Hawaii, both varieties of movement can involve massive blocks of real estáte. In the huge Nu'uanu debris slide, stone blocks 6 miles across tumbled 30 miles out to sea. Both slumps and debris slides may create colossal tsunamis. (Tsunamis are miscalled "tidal waves," but they have nothing to do with tides and do not behave like tides or wind-driven waves.)

When lar ge pieces of the Hawaiian Islands slip into the ocean, the entire Pacific Rim is smashed by the resulting tsunamis. In New South Wales, Australia, there is geological evidence that part of this coast was scoured by a Hawaii- generated tsunami 100,000 years ago.
The postulated wave started out ahout 375-meters (i-mile) high in Hawaii. By the time is reached Australia, it was about 40 meters high. (vol. 1, p. 227)

Worse waves may be on tap. A 4,760 cubic mile chunk of the Big Island (Hawaii) is breaking away at the rate of 4 inches per year. This is the Hilina Slump, and it is said to be "the most rapidly moving tract of ground on Earth for its size." The Hilina Slump can move muoh faster. At 4:48 AM, November 29, 1975, a 37-mile-wide section suddenly dropped 11J feet and slid seaward 26 feet. The result was a magnitude-7.2 quake and a 48-foot-high tsunami. This was a minor adjustroent of the slump. If the entire 4,760-cubic-mile block decided to break off, it would probably create a magnitude-9 quake and a tsunami 1,000- feet high. All the coast-hugging cities of the Hawaiian Islands would be swept away. And LOOK OUT Australia, Japan, and California.

(Napier, A. Kam; "Landslide," Honolulú, p. 28, February 1997. Cr. H. DeKalb)

Comment. Tsunamis travel at jet speeds on the deep, open ocean and have such small amplitudes that ships rarely notice them. Only when they reach shal- low water do they slow down and reach monstrous sizes.

FLANK COLLAPSES: GENERATORS OF GIANT TSUNAMIS

One type of eatastrophe unmentioned in Van Flandern's reanalysis of the KT event (p. 202) is the "flank collapse" of the sides of steep volcanoes cióse to an ocean. In a flank collapse, a huge chunk of real estáte suddenly slides into the ocean creating a tsunami that may reach a height of 100 feet when it beaches on a shore thousands of miles away. By "huge chunk" we mean thousands of cubic miles. Over the past 20 million years some 70 big slabs of the Hawaiian Islands have slid miles out into the Pacific, creating tsunami deposite as far away as Australia. The Canary Islands create a significant tsunami threat, too, but in the Atlantic.

**Flank eollapses around Hawaii may happen soon and suddenly. In early November 2000, an array of 20 GPS (Global Positioning System) units installed on the side of Kilauea volcano on the Big Island (Hawaii) recorded that the vol- cano's flank was slipping 6 centimeters a day. Fortunately, motion ceased after 36 hours. This chunk measured 20 kilometers long by 10 kilometers wide. If it had disappeared suddenly under the waves and slid for several miles, California and other shores around the Pacific would have been hit by tsunamis
approaching 100 feet in height-----as has happened on the average every 10,000 years.**

(Ward, Steven N.j "Slip-Siding Away," Nature, 415:973, 2002. Cervelli, Peter, et al; "Sudden Aseismic Fault Slip on the South Flank of Kilauea Volcano," Nature, 415:1014, 2002) "

Comment. It is not clear from the above references whether this recent slippage occurred at the famous Hilina Slump (the weU-named "Big Crack"), also located on the Big Island. (above)

SANDSLIDES: DESERT CATASTROPHES

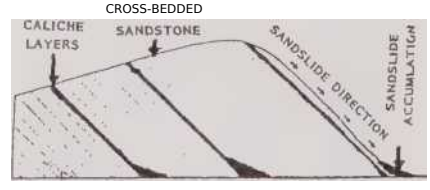
Some of the most important fossil dis-coveries being made today come from the desoíate Gobi Desert—a most unlikely place for the sudden mass burial of agile animáis. Furthermore, the fossils now coming to light in the Gobi sandstones are not only abundant but also preserved with great fidelity. For example, at Ukhaa Tolgod, paleontologists are exca- vating the planet's largest assemblage of fossil vertebrates from the end of the Cretaceous Period (71-75 million years ago). In 1993, about 1,000 fossils repre- senting 20 species of mammals and reptiles were collected. Amazingly, these bones were not disarticulated, scattered about, or severely worn. It was obvious that the Ukhaa Tolgod animáis had been very suddenly engulfed by a "tidal wave" of sand. It was a catastrophic event of some sort.

But what kind of catastrophes occur on deslóate, riverless deserta? Wind is always blowing sand about and dunes creep along in deserta, but healthy animáis easily avoid burial. Of course, there are rare, sudden downpours even on the Gobi. But one would expect this rain to be quickly absorbed by the sand.

Intrigued by the evidencé' of unex-pected catastrophism in the Gobi, scien-tists from the American Museum of Natural History first took a look at Nebraska's strange Sand Hills. These Sand Hills stretch for thousands of square miles, reach heights. of 400 feet, and are believed to be of aeolian origin during the Pleistocene. (See ETM7 in Carolina Bays) Being a modern analog of the ancient Gobi, the Nebraska Sand Hills might provide some insights as to what happened long ago in the Gobi.

An important clue occurs during the summer, when heavy thunderstorms some-times trigger avalanches of wet sand called "debris flows". These sandslides may be 900 feet long, 50 feet wide, and 4 feet deep. Although they have occa- sionally partly buried ranch buildings, they are too slow and small to endanger livestock and wild anímala. But what if they were much larger. and faster?

Back on the Gobi, geologists remarked that the rich fossil deposits were found in structureless sandstone; i.e., there was none of the cross-bedding seen in sandstones elsewhere in the región. Furthermore, fossils were extremely rare in the cross-bedded sandstones, which were built up over long periods of time. It looked as if the structureless, fossiliferous sandstones were sandslides differing from those in Nebraska in their much greater magnitude. But why were the Gobi sandslides so much larger and, apparently, faster?



Gobi sandslides occurred when impervi- ous caliche layers helped fluidize the sand. Only the sandslide accumulations contain fossils of high fidelity.

The next clue carne from the recent devastating mudflows in California and Central America caused by heavy rains. These debris flows were made deadly when the infiltrating rainwater was blocked by bedrock. The accumulating water turned the soil into a muddy slurries that raced down hills at high velocities, overtaking animáis (including many people) trying to escape.

There is no bedrock in the Gobi, but a little digging encountered impervious layers of caliche. The Gobi caliche consista of layers of sandgrains cemented together by caleium carbonate. Typicall located 2-3 feet below the dune surfaces,

the caliche layers were evidence that the Gobi had experienced benign periods in the past with low winds, atable dunes and more moisture. But when heavy rains doused the Gobi dunes, the water was blocked by these caliche layers. . Result: fluidized sand and catastrophic sand slides. These Cretaceous events were deadly for wildlife but blessings for future paleontologists.

(Dingus, Lowell, and Loope, David;. "Death in the Dunes," Natural History, 109:50, July-August 2000)

Comment. The anomalous fossils have been explained by a little digging and good reasoning.

MARINE INCURSIONS

GIANT IMPACT-WAVE DEPOSIT ALONG O.S. EAST COAST

Along the shore from North Carolina to Maryland and also into Chesapeake Bay, deep-sea drillers have charted the Exmore Boulder Bed. No minor deposit this; it is is over 60 meters thick in places and covers more than 15,000 square kilometers. In the bed are found boulders (up to 2 meters in diameter), cobbles, pebbles, and traces of tektite glass and shocked quartz. The youngest microfossils date from the Eocene, and argón dating of the ejecta yield a date of 35.5 million years, whieh correlates with the North American tektite strewn field. C.W. Poag et al interpret this boulder bed as follows:

> **On the basis of its unusual character- istics and its stratigraphic equiva- lence to a layer of impact ejecta at Deep Sea Drilling Project (DSDP) Site 612 (New Jersey continental slope), we postúlate that this boulder bed was formed by a powerful bolide- generated wave train that scoured the ancient inner shelf and Coastal plain of southeastern Virginia. The most promising candidate for the bolide impact site (identified on seismic reflection profiles) is 40 km north-northwest of DSDP Site 612 on the New Jersey outer continental shelf.**

(Poag, C. Wylie, et al; "Deep Sea Drilling Project Site 612 Bolide Event: New Evidence of a Late Eocene Impact-Wave Deposit and a Possible Impact Site, U.S. East Coast," Geology, 20:771, 1992.)

Comment. Our planet's land surfaces are also strewn with many debris deposita that are probably the consequence of giant impact waves. See ESM12 in Neglected Geological Anomalies, where they are termed "marine incursions."

AN ARKANSAS TSÜNAMI DEPOSIT?

Yes, Arkansas is hundreds of kilometers from any ocean. Could a tsunami ever reach Little Rock, or even 120 kilometers northeast of Little Rock where, atop a 76-meter (250-foot) hill are perched giant blocks of sandstone.
These blocks range up to 7.6 meters (25 feet) in size and weigh many tons.
No native rocks in the area match them. The Ice Age glaciers never reached Arkansas, so they can't be glacial errática. Where did they come from? One clue is the presence of glauconite in the sandstone. Glauconite is common in marine rocks, so suspicion points toward the Gulf of México.

Geologist G. Patterson, University of Memphis, thinks that the huge chunks of sandstone carne from coastal Louisiana and were carried some 650 kilometers (400 miles) inland by the giant tsunami raised by the asteroid or comet that smashed into the Yucatán to cióse out the Cretaceous. That, of course, was when the dinosaurs were forced into oblivion. But could the tsunami really have transported such huge rocks 650 kilometers?

(Falk, Dan; "Washed Up," New Scientist, p. 26, November 7, 1998)

Comments ■ Tsunami debris from the end-Cretaceous impact has been found along the Gulf Coast and on some Carib- bean islands. In northeastern México, geologists have found a debris layer 3- meters thick that is also of the right age. This layer contains tektites, glass spheres, plant material, and an iridium anomaly. (vol. 1, p. 227) However, these debris deposite can hardly compare to the far-inland Arkansas sandstone chunks.

THE ELTANIN ASTEROID HITS

About 2.2 million years ago, a chunk of space debris about a kilometer in diameter splashed down in the Bellings- hausen Sea between Antárctica and South America. It was some splash! The splash zone was about 20 kilometers across, waves 4 kilometers high raced away from Ground Zero, and a column of salt water ascended miles high into the upper atmosphere. The TNT equiva- lent is estimated at 12 billion tons.
Ice clouds formed and shaded the planet, causing severe climate changes. On the floor of the Bellingshausen Sea, 5 kilometers deep, lies the Eltanin Impact Structure.

Today, we can still see the geological consequences thousands of kilometers from the impact point. The puzzling re- mains of marine diatoms in Antarctica's dry valleys may well be fallout from the cubic kilometers of seawater blasted out of the Bellingshausen Sea. More formidable were the giant tsunamis that fanned out at jet speeds toward South America and Australia. On the deep ocean these tsunamis were only 20-40 meters high, but as they approached land, they slowed and piled up into walls of water that approached a kilometer in height. Even after 2.2. million years, geologists think they can see traces of these tsunamis in Australia and New Zealand. The mysterious bone beds near Pisco, Perú, may also have been the work of the tsunamis. Here, geologists find a deposit containíng bones of both marine and terrestrial animáis mixed together as if by a giant blender.

(Hecht, Jeff; "A Bigger Splash," New Scientist, p. 11, November 1, 1997. And: Anonymous; "The Splash Felt 'round the World," Earth, 7:12, April 1998)

GIANT AUS TRALIAN MARINE INCURSIONS

Australia sits in the middle of a very quiet tectonic píate far from the usual sources of those great earthquakes and landslides that raight send giant tsunamis surging toward this lonely landmass. Regardless, Australian geomorphologist T. Bryant and his colleagues have found convincing geological evidence of six major marine incursions spotted around this continent's long coastline.

The evidence ineludes:

- **Boulders jammed into crevices far above the high-tide marks;**
- **Car-sized blocks lifted over 100- meter-high cliffs; and**
- **Sea shells washed 35 kilometers inland.**

Back in 1992 (vol. 1., p. 227), Bryant opined that tsunami signs along the coast of New South Wales might have been the result of the massive landslides that in the past carried Hawaiian real estáte far out to sea. (p. 202) He now believes these landslides to have been inadequate and too distant to account for the Australian marine incursions he has indentified. Today, Bryant favors meteorite "splashes" in the surrounding oceans. The largest potential tsunami event on his list, he thinks, would have required a meteorite 6 kilometers in diameter impacting in the middle of the Pacific to cause the geological mayhem he has recorded.

Two of Bryant's postulated giant tsunami incursions have been carbon- dated at about 4,000 B.C. and at some- time in the 16th. Century A.D. Both waves were large enough to swamp Australian headlands 130 meters (500 feet) high. The latter event coincides with a Maori legend called "Fires of Tamaatea," , which describes fire falling from the sky and widespread death.

The largest of the Australian marine incursions seem to have been inflicted at intervals of 1,000-1,100 years. The implication is that the earth passes through a particular trail of cometary debris once per millennium.

(Jones, Nicola; "Get Ready for a Killer Wave," New Scientist. p. 15, September 14, 2002)

THE BOSPORUS SILT PLUG BLOWS

We present below the reconstructions of a postulated major terrestrial catas- trophes. It is based on sound geological research involving deep-sea cores, seismic profiles, and the like; but the reconstruction of the events is on the speculative side, particularly in matters of the magnitudes of the effeets. This

event purports to explain some long-standing puzzles.

During the last Ice Age, global sea levels dropped hundreds of feet ex- posing the continental shelves. The planet's great rivers cascaded over the edges in great waterfalls. The rocky sill at Gibraltar kept the Atlantic waters out of the Mediterranean, and this sea began to dry up. Farther to the east, the Black Sea was now cut off from the Mediterranean's salty water by the silt-choked Bosporus, that narrow strait separating Asia Minor from Europe. In consequence, the Black Sea became a vast fresh-water lake fed by Europe's rivers to the north.

The Ice Age eventually waned, and the oceans and Mediterranean began to rise. About 7,000 years ago, the hydraulic pressure on the Bosporus silt plug became too great and it popped. Salty Mediterranean water poured into lowlands around the Black Sea. Scien- tists estímate that 50 cubic kilometers of water surged through the Bosporus each day—200 Niagaras in one colossal waterfall. Falling some 150 meterá, the thunder of falling water might have been heard 500 kilometers away! The Black Sea rose quickly, driving the shoreline and humans back a kilometer or two every day.

On the supposition that the Bosporus silt plug ¿id rupture, the Black Sea would have filled in and expanded to the dotted Une.

The fleeing Neolithic farmers were forced up into the rich river valleys of Europe, carrying tales of the catastrophe as weH as their culture and agricultural know-how into these areas. The Middle East was affected, too. The traumatic experiences of the survivors may have been the basis for the Sumerian and Biblical flood stories.

(Mestel, Rosie; "Noah's Flood," New Sci- entist, p. 24, October 4, 1997. Also: Kerr, Richard A.; "Black Sea Deluge May Have Helped Spread Farming," Science, 279:1132, 1998)

WRONG-WAY FLOOD?

Back in 1997, Columbia University Bcien- tist W. Ryan proposed that, circa 7,500 years ago, a silt plug ruptured at the Bosporus allowing a colossal flood of Mediterranean water to pour into the shrunken Black Sea. (above) Given his proposed timing, Ryan and W. Pitman titled the book describing their research Noah's Flood. The flood was, they pro- claimed, an event that changed history.

Not so! says A. Aksu, at the University of Newfoundland, who sees in the evidence he has, a reversed flood. Aksu elaims that about 10,000 years ago, fresh water from the melting glaciers in northern Europe raised the level of the Black Sea to the point where it poured through the Bosporus into the salty, shrunken Mediterranean.

Except for the timing, Aksu's flood theory is the exact opposite of that of Ryan and Pitman.

(Heeht, Jeff; "Flood Hypothesis Seems to Hold No Water," New Scientist, p. 13, May 4, 2002)

Comment. Evidently, Nature's chapter on geology can be read differently! It will take a while to sort this one out.

FI RESTO RMS

THE DEADLIST FOREST FIRE IN AMERICAN HISTORY

October 8, 1871. Peshtigo, Wisconsin

This date is better known as the time Mrs. O'Leary's cow kicked over the lan- tern that ignited the great Chicago fire.

As Chicago burned, a much greater fire ineinerated 2,400 square miles of forest in northern Wisconsin. (This area is twice the size of Rhode Island!)

In 1871, the part of Wisconsin was sparsely populated, yet about 2,500 peo- pie failed to reach the relative safety of the many rivers and lakes in the area. Those who sheltered in their storm shel- ters were cooked. Those who lowered themselves into their wells were killed when the burning structures at the surface fell in on them. Even those lucky enough to reach deep water had to keep ducking under to keep their scalps from being singed. The accompanying fire tornados swept whole houses 100 feet into the air. Residente of Baltimore, over 1,000 miles away, noted the smoke in the western sky.

Bizarre stories emerged after the conflagration. One of the saddest is that of a man who had just seen his wife die horribly. Fearing for himself and his three children, he slit their throats and then his own. In tile end the fire skip- ped over them!

(Tasker, Greg; "Worst Fire Largely Unknown," Baltimore Sun, October 10, 2003)

Comment. The whole región, including Chicago, was under drought conditions in the fall of 1871. Still, new farmers were clearing their land and burning the brush, as were the lumbermen busy removing the Virgin forest. Human care-' lessness was partly to blame for what is often called the "Peshtigo Horror."

MISCELLANY

MILES OF FLOATING FOREST

February 13, 1905. San Francisco.

The Pacific Mail steamer City of Pan ama, which sailed from this port on Jan. 21 for ports on the Central American coast, had a strange ex- perience, news of which has just been received here by mail from Acapulco.

Through miles of sea covered thickly with masses of vegetation, tree trunks, and the carcasses of dead animáis the steamer sailed, the debris at times being so thick that her progress was impeded. Some of the trees were five and six feet in diameter, and the dead animáis were of aU descriptions. The debris was encountered on Jan. 28 in latitude 16.58 north and longitude 100.29 west.

The officers of .the vessel were unable to explain the strange condi- tion, and when they arrived at Aca- pulco no light was thrown on the subject. It is supposed that the floating ■ mass was east up by some gi- gantic volcanic eruption on the Central American coast.

(Anonymous; New York Times, February 14, 1905. Cr. M. Piechota.)

Comment. No such cataclysm is in our re- cords !

INNER EARTH

CHEMICAL ANOMALIES

The diverse geochemical phenomena recorded in the first 150 issues of Science Frontiers have the potential to change our automatic acceptance of long-accepted theories for the origins of oil, coa!, and natural gas. Are all of biological origin? How did such immense reservoirs get filled?

•Petroleum sources. Precambrian oil, current refilling of reservoirs.

•Coal sources. Is some coal abiogenic?

•Gas sources. Methane burps, breathing bogs, missing helium. •Miscellany.

Claim of Ganges incorruptibility.

PETROLEUM SOURCES

REALLY ANCIENT OIL-------AND ABUNDANT LIFE

Geologists usually don't bother looking for oil in very ancient (Precambrian) rocks for two reasons:

(1) Conventional wisdom insiste that oil is derived almost exclusively from organic matter, and additional conventional wisdom assures us that life was exceedingly scarce on earth billions of years ago.

(2) Any oil that was created billions of years ago would have surely been destroyed by intense pr es sures and high temperatures over the eons.

Yet, Precambrian oil in commercial quantities has been found in formations up to 2 billion years oíd (in Siberia, Australia, Michigan, for example). While some of this oil might have migrated in- to the Precambrian rocks from younger source rocks, some of it does seem in- digenous and, therefore, ancient.
(vol. 1, p. 207)

Now, three Australian scientists (R. Buick, B. Rasmussen, B. Krapez) have discovered tiny nodules of bitumen (lumps of hydrocarbons) in sedimentary rocks up to 3.5 billion years oíd in Africa and Australia. These bitumen nodules were formed when natural hydrocarbons were irradiated by radioactive isotopes that coexisted in the ancient rocks. Futhermore, these African and Australian rock formations were never severely deformed or subjected to high temperatures. The possibility exists, therefore, that some of the earth's old- est rocks may contain substantial oil reserves. So far, no one has seriously looked for oil in Precambrian rocks be- cause of the two preconceptions noted above.

(Palmer, Douglas; "Any Oíd Oil?" New Scientist, p.22, March 14, 1998)

Comments. Large quantities of oil and bitumen 3.5 billion years oíd have pro- found implications. Far from being life- less, the most ancient of our planet's seas may have been thick soups of bacteria and other simple life forms.
So much terrestrial life so soon after the formation of the earth could imply that there was an extraterrestrial inocu- lation of biotic material that gave terrestrial life a jump start ----------assuming that this ancient oil and bitumen are truly biogenic! The possible (and highly anomalous) abiotic origin of oil and natural gas are covered in some depth in Anomalies in Geology.

THE MYSTERY OF EUGENE IRI AND 330

Eugene Island is a submerged mountain in the Gulf of México about 80 miles off the Louisiana coast. The landscape of Eugene Island is riven with deep fissures and faults from which spew spontaneous belches of gas and oil. Up on the surface, a platform designated Eugene Island 330 began producing about 15,000 barréis of oil per day in the early 1970s. By 1989, the flow had dwindled to 4,000 barréis per day. Then, suddenly, production zoomed to 13,000 barréis. Iri addition, estimated reserves rocketed from 60 to 400 million barréis. Even more anomalous is the discovery that the geologieal age of today's oil is quite different from that recovered 10 years ago. What's going on under the Gulf of México?

It is difficult to avoid the conclusión that the oil reservoir at Eugene Island is rapidly refilling itself from "some continu- ous source miles below the earth'B surface." In support of this surmise, analysis of seismic records revealed a deep fault which "was gushing oil like a garden hose.

The deep-seated oil source at Eugene Island strongly supports T. Gold's theory about The Deep Hot Biosphere. Gold holds:

> **that oil is actually a renewable, primordial syrup continually manufactured by the earth under ultrahot conditions and tremendous pressures. As this substance migrates toward the surface, it is attacked by bacteria, making it appear to have an organic origin dating back to the dinosaurs.**

The apparent deep-seated oil source at Eugene Island and Gold's ideas make Petroleum engineers wonder about a similar situation at the seemingly inexhaustible oil fields of the Middle East.

> **The Middle East has more than doubled its reserves in the past 20 years, despite half a century of intense ex- ploitation and relatively few new dis- coveries. It would take a pretty big pile of dead dinosaurs and prehistoric plants to account for the estimated 660 billion barréis of oil in the región, notes Norman Hyne, a professor at the University of Tulsa in Oklahoma. "Off-the-wall theories often turn out to be right," he says.**

(Cooper, Christopher; "it's No Crude Joke: This Oil Field Grows Even as It's Tapped," Wall Street Journal, April 16, 1999. Cr. C. Casale)

OIL DEPOSITS AND ROTARY PHENOMENA

Sometimes obscure and unlikely correla- tions lead to new insights. In this con- text, we are obliged to mention a most improbable connection proposed by Chemical engineer S. Mori in a paper pre- sented at the Spring 2000 meeting of the American Geophysical Union. Mori sus- pects that oil and gas deposits are linked to the origin of tornados!

> **In his paper, Mori said that positively charged oil deposits underground establish polarity with negatively charged oxygen ions at the surface. When a thunderstorm passes over the oil field, he thinks this subsurface polarity links up the with electric polarity established between clouds and ground, creating the vacuum that spawns the tornado.**
>
> **Over the years, Mori said he's built a data base of about 8,000 tornado ' hits in the United States for compari- son with the location of known oil and gas deposits. He said that studies in Kansas, Pennsylvania and Texas found a high correlation.**

(Lore, David; "Underground Oil One Twist in Tornado Theory," Charleston Dispatch, June 8, 2000. Cr. J. Dotson)

Comments. There have been numerous reporta of electrical and burning pheno- mena associated with tornados. See GWT1 & GWT2 in Tornados, Dark Days.

The oil-sodden lands of the Persian Gulf can be correlated with another sort of rotary phenomena: the strange phos- phorescent wheels of light that have been seen raany times swirling in the shallow waters of the Gulf. See GLW in Remarcable Luminous Phenomena.

COAL SOURCES

MINING FOR COSM1C COAL

One of T. Gold's more outrageous ideas holds that our planet's inventory of "fossil" fuels (gas, oil, coal) is not all of fossil origin; that is, some may be abiogenic. Indeed, there are so many anomalies associated with these three fuels that it is incumbent upon us to question the mainstream theories of their origins. (See ESC13, ESC14, ESC16 in Anomalies in Geology for details.) But Gold's theory has few adherents, so it was more than surprising to find an article bearing the aboye title in the June 2002 issue of Astronomy.

S. Kwok, University of Calgary, author of the article, does not "mine" cosmic coal. Rather, he tells us all the ways in which complex organic materials resembling coal are synthesized in extra- terrestrial objects. For example, the proto-planetary nébula CRL 618 churns out immense amounts of complex organic Chemicals. When CRL 618 eventually coheres into planets, its progeny will be well-stocked with carbonaceous matter. Then, there are the carbón stars and the carbonaceous chondrites. Kwok amply demonstrates that the earth, in theory at least, could have been be- . queathed all the makings of our "fossil" fuels in enormous quantities-----all without the cooperation of life forms.

Expanding on this, Mars and other Solar System bodies, seemingly lifeless, might yet harbor oil, gas, and coal.

(Kwok, Sun; "Mining for Cosmic Coal," Astronomy, 30:46, June 2002.)

Comment. Corning down to earth, is there any terrestrial evidence that some of our coal may be abiogenic? Much coal does have a woody structure, contains fossils, and is found in strata accom- panied by sandstone, shale and other sedimentary rocks. There are, however, some anomalous carbonaceous deposits that do not fit the sedimentary mold. Natural graphite is one; so is the Albert coal of New Brunswick. The latter coal occurs in vein-like deposits and must have been in a liquid state when formed. We should therefore keep our minds open regarding the possibility of "cosmic coal."

METHANE BURPS

DID A METHANE BDRP DOWN TWA800?

The potential for methane eruptions from offshore sedimenta to sink ships and down aircraft was proposed by W.D. Mclver way back in 1982, in the Bulletin of the American Association of Petroleum Geologists. (vol. 1, p. 208) The Bource of methane-gas releases ("burps") is the rapid decomposition of methane hydrate, which exists in prodigious quantities in offshore sedimente. Some geologists have estimated that there is twice as much methane in methane-hydrate deposits as in all terrestrial natural-gas fields.
What makes methane hydrate potentially lethal is its instability. Landslides and small quakes can release huge plumes of methane bubbles into the ocean and thence into the atmosphere.

Ships might founder in the low- density froth of bubbles, and aircraft might be adversely affected, too. This is where TWA800 comes in.

R. Spalding, a scientist at Sandia National Laboratories has been monitoring mysterious atmospheric explosiona and believes that some of these detonations are consistent with the atmospheric igni- tion of huge methane plumes. (Other detonations are due to meteors.) Spalding proposes the following scenario:

- **«The ocean floor releases a massive methane gas plume, which rapidly rises to the surface and ascends into the atmosphere.**
- **•The lighter-than-air methane cloud gains altitude, mixing with oxygen and thereby gaining explosive potential.**
- **•An electrical disturbance—possibly caused by the rising cloud itself or a lightning strike-----detonates the cloud.**
- **•Awesome energy is instantly re- leased in the form of a devastating shock wave and fireball that shat- ters nearby TWA Flight 800.**

Supporting Spalding's theory are the many reports of light flashes, light streaks, and booming/rumbling sounds accompanying the disaster. But, methane burps are bizarre, and the properties of methane hydrate are so unfamiliar to most scientists and investigators of aircraft dlsasters that Spalding's idea has received scant attention.

(Spohn, Lawrence; "Earth 'Burp' Might Have Downed Jet, Scientists Says," Albuquerque Tribune, January 20, 1997. More appeared in the January 24, issue. Cr. R. Spalding.)

Comment. The phenomena accompanying methane burps are well known to SF readers. First, there are the common offshore booms that have been reported for centuries (p. 178 and vol. 1, p. 283) and; second, the large cráters (up to 100 meters across) observed in seafloor sedimente (vol. 1, p. 197).

The Albuquerque Tribune article mentioned several other specific atmo- spheric detonations that have attracted attention: Newfoundland (1978); Spain (1994; Poland (1995); and Honduras (1996). Often such events are noticed only by surveillance satellites. However, the 1996 Honduras event was seen and heard by many residents of the area. See the next entry.

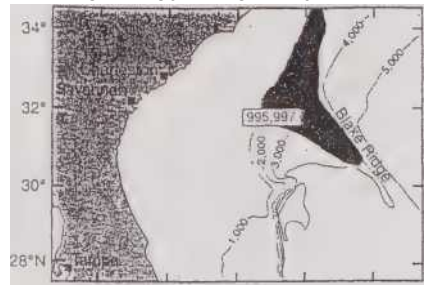
METHANE BÜRPS AND GAS-HYDRATE RESERVOIRS

Readers will be. forgiven for any skep- ticism they may harbor about methane burps from the sea floor bringing down TWA flight 800. (above) The media have said little about the staggering quantities of methane and higher hydrocarbons locked up in frozen hydrates around the edges of the continente. ActuaUy, the small methane burps are minor problems compared to the catastrophic climate changes that could be forced if just a small portion of the gases frozen under the sea floor were released into the atmosphere.

Gas-hydrates are unimpressive when brought to the surface—just dirty, fizzy ice. However, taken together, they eontain more carbón than all the world's oil fields, perhaps much more. Most estimates fall between 1,700 and 11,000 billion tons, but there is one scientist who pegs these cold-storage carbón deposits at 4,100,000 billion tons. In comparison, human releases of carbón to the atmosphere via the burning of wood, gas, coal, and even the coHective flatulence of all the planet's animáis are trivial.

Geological evidence confirme that past climate swings were associated with large injections of carbón into the atmosphere and oceans. A major contributor to these "carbón burps" may be decom- posing methane hydrate. Until recently, climatologists have questioned the sizes of gas-hydrate deposits, but cores ex- tracted from the Blake Ridge off the Carolina coast confirm the immense amounts of gases precariously locked up in sea-floor sedimenta.

The stratum of gas hydrates in the Blake Ridge alone covers 26,000 square kilometers—enough gas is there to sup- ply the D.S. for 107 years. In biologi- cal terms the Blake Ridge's carbón is equal to 7% of the carbón locked up in all terrestrial biota —animáis, trees, grasses, etc. And the Blake Ridge gas hydrates represent a miniscule fraction of the planet's frozen gas hydrates.



The Blake Ridge is indicated in black. Area: 26,000 km² Huge quantities of methane hydrate and free gas exist below the seafloor surface. Drill sites 995 and 997 are indicated. V. S. cocLst is shown to the west.

(Dickens, Gerald R., et al; "Direct Measurement of In Situ Methane Quanti- ties in a Large Gas-Hydrate Reservoir," N ature, 385:426, 1997. Also: MacDonald, Ian R.; "Bottom Line for Hydrocarbons," Nature, 385:389, 1997)

Comment. Methane is well-known as a "greenhouse gas." If really large "burps" were released, cümatic ehanges would probably ensue. Unfortunately, gas- hydrates are rather unstable. What would happen if a large asteroid slammed into the Blake Ridge? Huge quantities of methane would disgorge into the earth's atmosphere. The climate ehanges might be disastrous for fauna (like the dinosaurs!) and flora.

OTHER GAS SOURCES

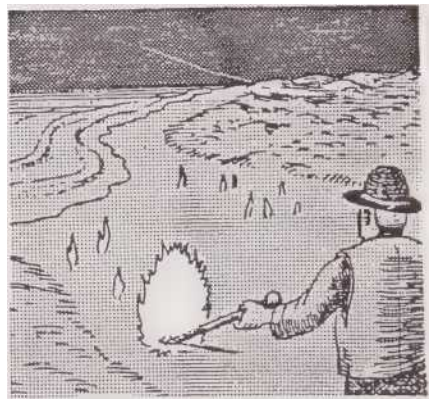
BOG BREATH

Yes, bogs do breathe albeit rather erratieally. The slow heaving of their surfaces is a poorly understood pheno- menon as the following abstract demon- strates.

> **The surfaces of bogs and fens in northeastern Minnesota may rise and fall by as much as 36 em in a single day. This phenomenon, known as - Mooratmung, or bog breathing, has been traditionally attributed to ehanges in water storage. However, the surface deformations recorded by static GPS [Global Positioning System] stations on bog and fen sites within the Red Lake peatland are more frequent and out of phase with precipitation events. These vertical fluctuations instead appear to be re- lated to a complex interplay among climate, hydrology, and microbial gas- production. Climate-driven re- charge on bogs, for example, stimu- lates the production of biogenic gases by advecting root exudates deep into the peat profiles. Seasonal droughts, however, favor the formation of tran- sient confining layers that trap biogenic gases into discrete pockets...**
> **Bog breathing may therefore be a surface manifestation of the accumula- tion and release of greenhouse gases in peat deposits.**

(Glaser, Paul H. et al; "Bog Breathing: the Curious Interplay of Climate, Ground- water, and Greenhouse Gases in Boreal Peatlands," Eos, 80:F47, 1999)

Comment. When bogs breathe they release plumes of flammable gases which probably give rise to the many observations of will- o'-the-wisps in marshy areas. Why these gas clouds are luminous remains mysterious. (GLN1 in Remarkable Lumi- nous Phenomena) Explosive releases of similar biogenic gases probably cause most of the booms mentioned in the fore- going digests. Obviously, the energy releases in will-o'-the wisps are less powerful.



Spontaneously igniting, biogenic gases are found in many marshy places. These eruptions were observed on an English mud fíat in 1902.

THE NODOROC

> **Buried behind Phil Chandler's farm three miles east of Winder [Georgia], underneath some scrawny trees and unearthly black mud, is a mystery or terror perhaps thousands of years oíd.**
>
> **"It's real dangerous," said Fred Ingram, former director of the Bar- row County Historical Society. "If you step off in some of that soupy mess, you're gone."**
> **Before the Harrises drained and worked the land, the area was more than a geographical oddity. It was a sinister place with a reputation among American Indians and early settlers as a burning lake of fire.**
> **"The Indians called it Nodoroc," said Mr. Chandler, leading a recent tour along the edges of the pit, "But what they meant was Hell."**
> **Although few signs remain today, the area was once a bubbly cauldron, a mud volcano from which a steady stream of foul gases ignited into an eerie plume of black smoke that could be seen for miles, according to nu- merous accounts from white settlers and Creek Indians inhabiting the area in the late 1700s.**
>
> **The Nodoroc slowly declined in intensity, and one day in the mid- 1800s it blew up in an awesome explosión of mud and heat and expired.**

(Stcnger, Richard; "Histories of Area Describe Terror," Augusta Chronicle, June 11, 1996. Cr. L. Farish)

Comment. Was the energy source of the Nodoroc volcanic or Chemical (as from decaying organic material). It's final death throes resemble the explosión of Lake Monoun, Cameroon, in 1984. (See vol. 1, p. 211.)

CHINA'S BERMUDA TRIANGLE

For "triangle" watehers, we provide the following news Ítem:

> **Some 50 scientists recently surveyed Southwest Sichuan Province's notori- ous high-elevation Black Bamboo Ravine, or Heizugou, where people and livestock have vanished. The Beijing-based Xinhua News Agency reports that scientists believe rotting plants found in the coid, humid región give off a poisonous gas, "suffo- cating people and making them fall into the abyss." The experts also explain that the magnetic field at Heizhugou "is so strong that it is likely to disable compasses and cause plañe crashes."**

(Anonymous; "China's 'Bermuda Tri- angle'," World Press Review, p. 27, July 1995. Cr. C. Masthay.)

Comment. Except for the magnetic field part, Black Bamboo Ravine can be aB- signed to category ESC5 in Anomalies in Geology, where one also finds YeUow- stone's Death Gulch and Java's Poisoned Valley.

THE MISSING HELIUM

The situation now described is analogous to the saga of the "missing solar neu- trinos" mentioned on _p. 81. Here, it is our model of the earth's interior rather than that of the sun that is at risk. There is simply not enough helium escaping from earth's crust to account for the heat flowing outwards from our planet's core.

You see, most of the earth's internal fires are fueled by the radioactive decay of uranium and thorium. The heat pro- duced by these disintegrations event- ually makes its way to the surface where we can measure it. but the helium (^He) created by the radioactive decay -of the uranium and thorium is mostly missing.

The diserepancy is large, and scien- tists are confronted with the possibility that we are wrong about either the source of the earth's heat or the facts of nuclear physies. You can bet it will not be the latter. We are confident that helium atoms eannot change their type like those solar neutrinos! Neither can we blame Chemical sequestration because helium is a noble gas. Perhaps the missing helium is physically trapped and stored somewhere in the earth's mantle.

> **No one knows the answer; ñor does any one pay much attention' to this clearcut anomaly.**
>
> **(Chin, Gilbert, ed.; "A Scarcity of Gas," Science, 292:2219, 2001)**

MISCELLANY

PLUMES AND HOT SPOTS

THE INCORRUPTIBILITY OF THE GANGES

The Ganges is 2525 kilometers long. Along its course, 27 major towns dump 902 million liters of sewage into it each day. Added to this are all those human bodies consigned to this holy river, called the Ganga by the Indians. Despite this heavy burden of pollutants, the Ganges has for millennia been re- garded as incorruptible. HoW can this be?

Several foreigners have recorded the effects of this river's "magieal" cleans- ing properties:

> (1) Ganges water does not putrefy, even after long periods of storage. River water begins to putrefy when lack of oxygen promotes the growth of anaerobio bacteria, which produce the tell-tale smell of stale water.
>
> (2) British physician, C.E. Nelson, observed that Ganga water taken from the Hooghly—one of its dirtiest mouths-·-by ships returning to Eng- land remained fresh throughout the voyage.
>
> (3) In 1896, the British physician E. Hanbury Hankin reported in the French journal Anuales de l'Institut Pasteur that cholera microbes died within three hours in Ganga water, but continued to thrive in distilled water even after 48 hours.
>
> (4) A French scientist, Monsieur Herelle, was amazed to find "that only a few feet below the bodies of persons floating in the Ganga who had died of dysentery and cholera, where one would expect millions of germs, there were no germs at all.

More recently, D.S. Bhargava, an Indian environmental engineer measured the Ganges' remarkable self-cleansing properties:

> Bhargava's calculations, taken from an exhaustive three-year study of the Ganga, show that it is able to reduce BOD [biochemical oxygen de- mand] levels much faster than in other rivers.

Quantitatively, the Ganges seems to clean up suspended wastes 15 to 20 times faster than other rivers.

(Kalshian, Rakesh; "Ganges Has Magieal Cleaning Properties," Geographic, 66:5, April 1994)

FOSSIL MANTEE PLUME DNDER SOUTH AMERICA

> In a challenge to a major aspect of the theory of píate tectonics, NSF- supported scientists have discovered the presence of an ancient conduit deep in the Earth's mantle beneath Brazil.
>
> The conduit appears to have remained geographically fixed with re- spect to the overlying continent despite thousands of kilometers of South American píate motion. This observation runs contrary to a major tenet of píate tectonic theory—that the motion of lithospheric platee is essentially independent of flow in the upper mantle beneath the plates— and implies that the upper mantle and the overlying South American continent have remained coupled since the breakup of the Gondwanaland super- continent and opening of the South Atlantic Ocean some 120 million years ago. This result also implies that large-scale convection in the mantle may be responsible for the motion of the great continental plates, such as South America, where the driving forcé for píate motion has not been well understood.

(Dybas, Cheryl; NSFNEWS Digest 54, Ñovember 8, 1995. Cr. D. Swaner. NSF= National Science Foundation. The cyber- address ıв: nsfnews@nsf.gov)

The computerless may read more in:

(VanDecar, John C., et al; "Seismic Evi- dence for a Fossil Mantle Plume beneath South America and Implications for Píate Driving Forces," Nature, 378:25, 1995)

PRE-QUAKE THERMAL ANOMALIES

The Science literature contains many reporte of pre-quake luminous phenomena, radio noise, magnetic-field anomalies, ionospheric irregularities, and the like. Some of these observations go back cen- turies. But it wasn't until properly instrumentad satellites began surveiUing the planet that pre-quake thermal anomalies were detected.

> On the basis of satellite infrared thermal images of the Earth's surface, thermal anomalies have been identified that are associated with large linear structures and fault systems in the Eartn's crust. Sometimes, days before an earthquake, short-lived thermal anomalies develop in the area around the future epicenter, often elongated and measuring tens to hundreds of kilometers, with a positivo deviation of 2-3°C. They reportedly begin 5-10 days before and disappear rapidly 1-2 days after the earthquake.
>
> This increase in the Earth's ap- parent ground temperature is not understood.

Earthquakes do not release enough energy to heat up such huge volumes of ■ rock; and the thermal spike is too short- lived given the thermal inertia of the rocks involved. So, the rock and soil are probably not heated; the temperature rise is superficial. The currently favored explanation blames the widespread release of hot gases from the fault areas. The article's author, however, favors the com- bined effects of several electromagnetic phenomena that simúlate temperature rises, such as coid, electromagnetic glows.

(Freund, Friedemann T.; "Rocks that Crackle and Sparkle and Glow: Strange Pre-Earthquake Phenomena," Journál of Scientific Exploration, 17:37, 2003)

Comment. The presently favored explana- tion based upon the release of hot gases may be related to the corpus of vague oíd reports on "earthquake weather." In 1850, R. Mallet, an assiduous recorder of geo- physical phenomena wrote:

> In the south of Europe a general be- lief prevailed that calms, oppressive heats and a misty atmosphere were the usual preludes of earthquakes.

(Mallet, Robert; "On the Facts of Earthquake Phenomena," Report of the British Association, p. 67, 1850)

ANTIPODAL HOTSPOT PAIRS

Hotspots are isolated areas of the earth's crust where there is an un- usually large amount of basaltic volcano ' activity. At present, over 120 hotspots are recognized by geophysicists—and they are not distributed randomly about the globe. In fact, many seem to be dia- metrically opposite one another, as de- scribed by M.R. Rampino:

> The observed number of antipodal hotspot pairs depends on the máximum allowable deviation from exact antipodality, At a máximum deviation of 700 km, 26% to 37% of hotspots form antipodal pairs in the published lists examined here, significantly more than would be expected from the general hotspot distribution.
>
> Two poBsible meehanisms that might create such a distribution inelude:
>
> (1) symmetry in the generation of mantle plumes; and (2) melting related to antipodal focusing of seismic energy from large-body impaets.

(Rampino, Michael R.; "Antipodal Hotspot Pairs on the Earth," Geophysical Research Letters, 19:2011, 1992)

Similar Phenomenon. On the moon, the mageons (magnetic concentrations) seem to be located diametrically opposite large lunar impact basins. See ALZ3 in The Moon and the Planets.

INTERNALSTRUCTURES

BEPLUMING THE EARTH

For 40 years or so, geologists have believed that they had the problem of Hawaii and Yellowstone solved. These two places (and several others) are famous (at least to geologists and geo- physicists) as centers of "mid-plate" volcanism.

Most voleanoes erupt around the edges of the earth's tectonic plates, where oceanic plates are subducted under continental plates, providing plenty of opportunity for volcanic activity at these weak spots in our planet's integument. But voleanoes in the middle of an oceanic píate (Hawaii) and a continental píate (Yellowstone) are anomalous. At least they were until the early 1970s, when J. Morgan proposed the idea of "thermal plumes." These were seen as fountains of hot magma rising toward the surface from the earth's core 2,900 kilometers below. Wherever thermal plumes neared the surface, "hot spots" formed. Voila! Mid-plate voleanoes!

What's more, these hot spots would create chains of voleanoes of decreasing age as the tectonic plates drifted slowly across the stationary hot spots. Voila! Chains of mid-plate voleanoes, such as Hawaii and the Tuamotu Archipelago. Thermal plumes quickly became a key geologieal paradigm.

Despite its revered position, the concept of thermal plumes has been shot through with the following holes:

- •The magmas from mid-plate voleanoes are substantially different from those of plate-edge magmas, suggesting a different mechanism at work.
- •Thermal plumes are hypothesized to remain fixed but they do not.
- •Seismic study of the underpinnings of Iceland—surely a hot spot— reveáis no thermal plume.
- •Similarly, Yellowstone is underlain by magma, but it is a shallow body only 200 kilometers deep, hardly a thermal plume.
- •Surprisingly, at Hawaii, Yellowstone, and other supposed manifestations of thermal plumes, there is not the substantial leakage of heat from the earth's interior one would expect from a plume of magma rising direct- ly from the hot core.

The doubters want to replace thermal plumes with stress-caused cracks in the tectonic plates.

(Jones, Nicola; "Volcanic Bombshell," New Scientist, p. 33, March 8, 2003.)

Comment. If the thermal-plume paradigm collapses, can the even-more-vital plate-tectonics paradigm be far behind?

THE KTB HOLE

KTB = Kontinentales Tiefbohrprogramm der Bundesrepublik Deutschland

If you could drop a pfennig down the KTB hole, it would take several minutes to hit bottom, for this research drill hole has now. penetrated to 7.5 kilometers. It is the second deepest man-made hole, after the Soviet 12-km hole in the Kola Península. Drilled solely for scientific purposes, the rocks and strata encoun- tered by the KTB drill bits have forced the redrawing of Germán geologieal maps. The "real" subterranean world turned out to be quite different from that inferred from both surface indiea- tions and the seismic and electrical probing of the depths. Three specific surprises are worth mentioning:

•Temperatures in the drill hole rose far faster than predicted.

•The expected boundary ("suture") between two oíd tectonic plates thought to exist at 3 km according to surface geology had not yet appeared at 7.5 km.

•Most interestingly, crevicular structure (crevices and pores) existed at almost all depths, even though theory said they could not because of intense pressures. And these voids were filled with fluids. P. Keher, a KTB scientist, was amazed at what the drill found:

> When I started 25 years ago, the idea was that the deeper you go into the crust, the drier it gets.

(Kerr, Richard A.; "Looking---------Deeply—into the Earth's Crust in Europe," Science, 261:295, 1993)

Comment. Deep-living bacteria were not mentioned in the above article, but Soviet scientists claim to have pumped them up from 12 km down! Outer space may not be our final frontier despite the introductory blurb to Star Trek!

Unexpectedly complex stratigraphy was reveáled during the KTB drilling. (KTB, H. Bishop)

TWO RBALLY DEEP OCEANS

During our latest anomaly-collecting eyele, we carne across two reports on apparently identical phenomena. Neither article mentioned the work of the other!

Both groups of scientists processed massive quantities of earthquake records to form "seismic images" of struc- tures deep in the bowels of the earth. (The technique is ealled "seismic tomo- graphy.") Both groups have discerned huge slabs of crust that were once on the planet's surface but were subsequent- ly thrust ("subducted") down under the continents. These slabs are now hun- dreds of kilometers below the surface, and they have dragged water along with them. In fact, their water inventories may rival today's surface oceans; they may even have been surface oceans themselves millions of years ago before they descended into the infernal regions.

Only a few years ago, all geologists maintained that all water in subducted slabs was squeezed out of the rocks by immense pressure and later reappeared at the surface as volcanic steam.

Deep ocean #1. G. Nolet and A. Ziel- huis, Princeton seismologists, report a huge reservoir of water about 900 kilometers under present-day Europe. Some 400-500 million years ago, there was an ocean in this lócale.

(Zimmer, Cari; "The Ocean Within," Discover, 15:20, October 1994)

Deep ocean #2. H. Wysession, Washington University, has located a water-rich slab 250 kilometers thick at a depth of 2,700 kilometers under Indonesia. He thinks it might be the subducted floor of the paleo-ocean Tethys that last saw sunlight 250 million years ago.

(Redfern, Martin; "Lost Ocean Found Deep in the Earth," New Scientist, p. 16, September 3, 1994)

EARTHQUAKE PHENOMENA

THE GIANT CRYSTAL AT THE HEART OF THE EARTH

Geophysicists ha ve been forced to consider this possibility because of two anom alies:

(1) Seismic waves from earthquakes pass through the earth's core faster when they travel parallel to the earth's axis than when they travel in the plañe of the equator. The transit-time differ- ence is 2-4 seconds. Apparently, the earth's core is not perfectly spherical or its properties are different in differ- ent direetions.

(2) The natural vibration or "ring- ing" frequencies of the earth are "split," that is, instead of a series of single "tones" we deteet a series of elosely paired frequencies. This is symptomatic of a core that is anisotropic; that is, its properties are different in different direetions.

.T. Tromp, of Harvard, may have de- anomalized both sets of observations wxth a single theory:

> "For the shape of the core'alone to explain the observations," he says, the shape of the inner core would have to be very unrealistie." Instead, he claims that the inner core behaves like a giant asymmetric crystal, aligned with the Earth's axis so that seismic waves travel faster in that direction. Tromp's analysis fits neatly with suggestions that the inner core is made of a high-pressure phase of iron in which the atoms are close- packed in hexagons, because such a 'sigma' phase is anisotropic."

But, asks Tromp, how and why did the core material assume this crystal line character?

(Hecht, Jeff; "The Giant Crystal at the Heart of the Earth," New Scientist, p. 17, January 22, 1994)

Comment. How does this big iron crystal jibe with the dynamo theory of the earth's magnetic field? Could Tromp's "giant asymmetric crystal" produce a permanent magnetic field, thereby forcing the supposed dynamo to play second magnetic fiddle?

DEEP QUAKE DEEPENS MYSTERY

Most earthquakes are shallow, They are concentrated no deeper than 20-25 kilometers down. However, a few extremely deep quakes rumble at depths of about 600 kilometers. On June 8, 1994, what may be the largest deep earthquake of the century-----magnitude 8.2----exploded 640 kilometers beneath Bolivia. "Exploded" may or may not be the proper word. Geophysicists are really not certain what causes the very deep quakes, because at 640 kilometers rocks are so hot that they flow rather than snap under geological stresses.
The more common, shallow earthquakes are generaUy created when rocks snap and fracture. Since the deep quakes seem to be concentrated in subducted slabs of terrestrial crust that plunge down deep into the earth's mantle, geophysicists suppose that the increasing heat and pressure applied to the de- scending slabs may cause "explosive" phase changes in minerals contained in the slabs. Phase changes often involve volume changes that, if sudden, might generate seismic waves. Too, water of hydration in minerals may be explosively turned into vapor. But this is all sur- mise at present.

The Bolivian quake also caused the whole earth to ring like a bell. Every 20 minutes or so, the entire planet ex- panded and contracted a minute but de- tectable amount.

Another surprise: the Bolivian earthquake was felt a far away as Seattle— the first time that a quake in that part of South America has been actually felt in North America.

(Kerr, Richard A.; "Bolivian Quake Deepens a Mystery," Science, 264:1659, 1994. Monastersky, R.; "Great Quake in Bolivia Rings Earth's Bell," Science News, 145:391, 1994)

THE KIND OF FAULT YOÜ LIKE TO FIND

Earthquakes are concentrated along the boundaries between tectonic plates where oceanic plates dive under continental plates. Stresses naturally accumulate during such slow-motion collisions. The result: plenty of quakes. Mechanically, this model is very appealing, but there are puzzling exceptions. There are sections along píate boundaries obviously in collision where no earthquakes at all occur to relieve stresses. Quakes are felt on either side of these segments, but all is serene inside. These segments are termed "seismic gaps," They may stretch for hundreds of kilometers.

Theory insists that all seismic gaps must eventually be filled in. After all, the rocks can take only so much stress. Theory may be wrong because at least ten seismic gaps seem to be permanent. Something unexplained is transpiring beneath the surface that allows oceanic plates to slide quietly down under the continents and deep into the mantle.

One such permanent seismic gap is especially embarrassing to geophysicists. It stands out prominently on earthquaxe maps of the very active Peruvian coast. When the immense quake of 1974 shook this coastline, this gap was unperturbed. Neither did the many aftershocks viólate this charmed región. Not believing in subterranean magic, some geophysicists confidently (and very loudly) predicted this relucíant gap would soon yield.
After 23 years it is still there!

(Penvenne, Laura Jean; "When It's Bet- ter to Build on the Fault," New Scientist, p. 14, January 11, 1997)

RHYTHMIC SUBMARINE VOLCANOS AND EL ÑIÑOS

An El Niño commences when a giant high pressure system centered near Easter Island weakens slightly and causes a shift in the eirculation of Pacific Ocean currents. Weather pat- terns from North America to Australia lurch ponderously in sympathy. El Niños occur every 4-7 years, suggesting some periodic phenomenon is waving a geophysical baton.

The real cause of El Niños is still obscure. However, the recent discovery of over 1,000 previously unmapped submarine voléanos rising from the sea- floor in the eastern Pacific may lead to El Nino's source. The synchronous eruption of, say, 100 of these voléanos might warm the ocean around Easter
Island a tad-----just enough to warm the atmosphere above a bit—resulting in a shift of the high pressure area.

The area of intense voleanic activity covers 55,000 square miles of sea floor where the Pacific and Nazca plates are separating. In addition to the active volcanos, many plumes of 800°F water gush from the sea floor in this area.
The volcano-El Niño link is, therefore, not so far-fetched.

(Nash, Nathaniel C.; "Volcano Group in Pacific May Cause El Niño," Pittsburgh Post Gazette, February 14, 1993. Cr'. E. Fegert)

Comment. If submarine volcanos do cause the El Niños, and the El Niños are periodic, the submarine volcanism would have to be periodic, too. This implies an unrecognized rhythm in the earth's internal fires. ■

THE SONG OF THE EARTH

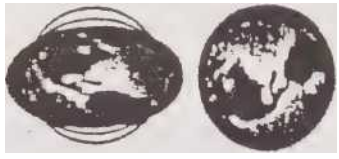
After a major earthquake, the entire earth quivers like a sphere of jelly suspended in space. Already a slightly óblate sphere, the planet becomes sue- cessively a bit more óblate, then a bit more prolate, as iHustrated. The amplitudes of these deformations are small, just a eentimeter or so after big quakes. The tone or frequency of the quivers is just a few millihertz, which translates to periods ranging from 3-54 minutes. We doubt that the telestomping elephants

GEOMAGNETIC PHENOMENA

mentioned on p. 125 can detect these quiverings.

That the earth does indeed "ring" is oíd news. Geophysicist A.E.H. Love ^ mentioned the possibility in 1911. It is also recognized that large earthquakes can set the earth to ringing ("quivering" is better). What is news is the discovery by N. Suda et al that our planet rings even when no major quakes are occurring, and no one yet knows why. Suda et al write:

> The observed "baekground" free oscillations represent some unknown dynamic process of Earth.



Suda and his colleagues detected these oscillations using a superconducting graviraeter, which they installed in a seismically-quiet place: Antárctica.

The favorite explanation for the baekground oscillations is turbulence in the earth's atmosphere. Ocean tides and currents are also on the list as potential "bell-ringers." [(Los) El Niños were not mentioned!]

(Suda, Naoki, et al; "Earth's Back- ground Free Oscillations," Science, 279: 2089, 1998. Also: Kanamori, Hiroo; "Shaking without Quaking," Science, 279:2063, 1998)

THE EARTH HUMS MORE LOUDLY IN THE AFTERNOONS

It has been known for almost a century that large earthquakes set the earth to ringing like a bell. Above, we re- ported that the planet also "hums" when there have been no earthquakes. Just what forces stimulate this seismic hum- ming of the earth-as-a-whole is still a matter of conjecture.

Actually, "hum" is a poor choice of words. The period of these vibrations ranges from 3 to 8 minutes, which puts them in the range of infrasound.

Recently, N. Suda of Nagoya Univer- sity has found a due suggesting that thunderstorms may excite these very-low-frequeney vibrations. Suda arid his col- leagues arialyzed the seismic records at four seismically quiet locations around the globe and discovered that the hum is loudest between noon and 8 PM local time. The quietest period is from midnight to 6 AM. These are the same time frames when thunderstorms are most active and quiet. It's circumstantial evidence, but it makes sense.

(Kerr, Richard A.; "Earth Seems to Hum along with the Wind," Science, 283:321, 1999.)

Comment. Infrasound in the atmosphere may origínate from storms thousands of miles away and from strong winds blow- ing across mountain crests. It appears that the earth is an immense, spherical aeolian harp!

THE MOTOR OF THE WORLD

The innards of our planet, as presently visualized, consist of an inner core of solid iron about 2,400 kilometers in dia- meter. Surrounding this is a fluid outer core, which in turn is wrapped onion- like by the mantle and outer crust. Earthquakes are always sending seismic waves through these regionB and jostling seismometers installed all over the globe. From this wealth of seismic signáis, geophysicists have found that the inner core, lubricated by the fluid outer core, rotates about 1.1° per year faster than the mantle and crust. The inner core interaets with the geomagnetic field and is, in effect, like the rotor of a slow, ponderous induction motor. Expanding upon this visión of the earth as a colos- sal electrical machine, E. Stokstad writes: .

> Electric currents of about a billion amps flow across the boundary be- tween the solid inner core and the fluid outer core that lies around it. In the presence of the Earth's mag- netic field, these currents generate massive forces that tug on the inner core. And because the outer coi-e has a relatively low viscosity, the inner core can spin freely.

(Stokstad, Erik; "Earth's Heart Is in a Spin," New Scientist, p. 18, July 20, 1996. The basic paper is: Song, Xiadong, and Richards, Paul G.; "Seismological Evidence for Differential Rotation of the Earth"s Inner Core," Nature, 382:221, 1996)

Comments. Awesome as this gigantic natural electric motor may be, it doesn't challenge any paradigma; in fact, it reinforces current notions concerning the origin of the geomagnetic field. The anomalist, however, inevitably asks ques- tions and makes iconoclastic connections.

- Why couldn't this planet-size piece of rotating machinery actually be a generator rather than a motor? The kinetic energy. of the faster-spinning inner core might actually create the geomagnetic field.
- What happens when the geomagnetic field reverses, as it has often done according to the magnetostratigraphic record? Does the earth's motor go into reverse?
- If the inner core can slip relative to the crust and mantle, why cannot the crust-plus-mantle slip, too— perliaps catastrophically? Pole-shift proponents will like this idea!

Allusion. The title comes from A. Rand's Atlas Shrugged. Of course, Rand's hero was talking about a very different kind of motor.

"ALMOST INCONCEIVABLE" CHANGES IN THE GEOMAGNETIC FIELD

A decade ago, a trio of geophysicists published a group. of papers based on their measurements of the remnant magne- tism of the 16-million-year-old layered lava flows at Steens Mountain, Oregon. (vol. 1, p. 234) At that time, they claimed that these finely bedded lava flows testified that, during a field reversal, the earth's field swung around at the astonishing rate of 3° per day! This rate is about one thousand times the current rate of polar drift. Main- stream geophysicists could not believe the 3°/day figure because it implied incredibly rapid changes in the flow of those molten materials within the earth that supposedly generate the geomagnetic field. The Steens Mountain data were "tabled"; that is, dismissed.

The three researchers, though, con- tinued their labors at Steens Mountain and have now offered additional, even more impressive data. They now find that the geomagnetic field probably shifted as much as 6° in a single dáy. Their work has been carried forward so professionally and meticulously that other scientists are finding their con- clusions harder and harder to dismiss. Instead, the search is on for explana- tions of the rapid field changes. Three possibilities have been advanced-----all of them unpalatable to geophysicists:

- The Steens Mountain rocks are not faithful recorders of the main geomagnetic field. Should this be actually so, the whole field of paleomagnetism, in- cluding píate tectonics, is undermined, for it depends upon similar measurements.
- The earth's molten core can change rapidly, at least in some regionB, in response to forces still unrecognized. This, of course, is not really a satis- fying "explanation."
- The dynamo theory of the origin of the geomagnetic field is incorrect.

(Coe, R.S., et al; "New Evidence for Extraordinarily Rapid Change of the . Geomagnetic Field during a Reversal," Nature, 374:687, 1995. Merrill, Ronald T.; "Principie of Least Astonishment," Nature, 374:674, 1995)

A LÜRCH OF DEATH

Two geophysicists, W. Sager and A. Koppers, have plotted 27 ancient pole positions dated between 120 and 30 milkon years ago. Using rock samples brought up from submerged Pacific sea- mounts, they find that the earth's mag- netic poles shifted 15-20° about 84 mll- li°n years ago. The north magnetic pole was not slowly drifting, it was lurching.' It took just a couple million years to 700 miles or more; that's more than ten times the rate of continental drift. The earth from afar must have seemed to be a disturbed top------on a geological time scale, of course!

. What could have perturbed the. earth?

One suggestion blames a sudden rhífting of the planet's mass distribution, some sort of subterranean indigestión, like a subducted oeean píate suddenly plun- ging through into the lower mantle.

(Kerr, Richard A,; "Did the Dinosaurs Live on a Topsy-Turvy Earth?" Science, 287:406, 2000)

The biological consequences of such a sudden tilting could have been severe.

> The event—known as rapid true polar wander----may have been accom- panied by worldwide volcanic uphea- vals and reorganization of tectonic plates that would have played havoc with anything living in the Late Cre- taceous period, 65 million to 99 mil- lion years ago.
>
> Although the notion that an aster- oid was the immediate cause of dino- saur extinction about 65 million years ago has won wide acceptance, many paleontologists have argued that vol- canic activity may have played a role in changing the climate and sending populations of the giant creatures into decline.

(Bowman, Lee; "Scientist's Say Earth's Magnetic Field Shifted Rapidly in Time of Dinosaurs," Dallas Morning News, January 21, 2000. Cr. D. Phelps.)

KOBE QDAKE JOSTLES THE GEO- MAGNETIC FIELD

Some luminous phenomena accompanying the January 17, 1995, Kobe earthquake were mentioned on p. 231. Geomagnetic perturbations were also recorded:

> At Kyoto University's observatory in Mmeyama, the terrestrial magnetism suddenly changed in a southeasterly direction by up to 0.6 nanotesla, for 30 seconds, as the quake began at 5:46 a.m. on Jan. 17.
>
> A similar geomagnetic variation was also observed at the university's observatory in Shigaraki, but the variation was in the opposite, north- westerly, direction.

(Anonymous; "Changes in Geomagnetic Field Noted during Quake," Daily Yomi- uri, Mareh 30, 1995. Cr. N. Masuya.)

A SHRINKING DIPOLF AND MIGRATING FLUX PATCHES

Three very disturbing things you may not have heard about the earth's magnetic field:

(1) The earth's main dipole field (that which torques your compass needle) is weakening precipitously. At the cur- rent rate, it will vanish in a millennium or so. In fact, the field may now be in the process ofreversing itself com- pletely. Magnetic north will become south and so on.

(2) Beneath the Southern tip of Africa resides a patch of reversed .magnetic flux where the field points down- ward rather than upward like it should. There are, in fact, more of these reversed-flux patches scattered around the planet.

(3) In school we were told how the overall geomagnetic field drifts westward.. It does, but not uniformly. The drift is rapid from Europe to the Far East but very small elsewhere.

(Olson, Peter; "The Disappearing Di- plole," Nature, 416:591, 2002. Jones, Nicola; "Magnetic Mix-Up," New Scien- tist, p. 11, April 13, 2002.

Comments. The above anomalies are hard to account for given our lack of access to exactly what's going on far beneath our feet and magnetometers.

Most worrisome are those migrating patches of reversed magnetic flux. Who knows where these patches were in the past and how many of them there were? Could they have distorted paleomagnetic measurements so much that our conclu- sions based upon píate tectónica are incorrect? Ancient Gondwanaland might have looked entirely differently!

Concern also extends to archeology, where artifacts are sometimes dated by magnetostratigraphy. Sometimes, too, fired pottery and other artifacts are dated by their remnant magnetism.

GEOLOGICAL MISCELLANY

OKLO PHENOMENA

PBECAMBRIAN NUCLEAR REACTORS!

On December 2, 1942, at Stagg Field, in Chicago, the first human-built nuclear reactor went critical. This feat has long been hailed as a triumph of the human intellect. Nature, though, had already beat E. Fermi and his colleagues by 2 billion years. For at Oklo and Bangombe, in the African Republie of Gabon, one flnds the "ashes" where some 17 natural nuclear reactors cooked away for hundreds of thousands of years. Opera- ting at temperatures as high as 360°C, they generated about 17,800- megawatt- years of energy.

The Gabon reactors were discovered ' in 1972 when the French found that uranium ore from Gabon contained anom- alously low concentrations of the fission- able isotope 235y as wep as fission producís. A little excavation work uncover- ed small pockets, a few meters in length and less than a meter in width, where natural fission had occurred in the Pre- cambrian period.

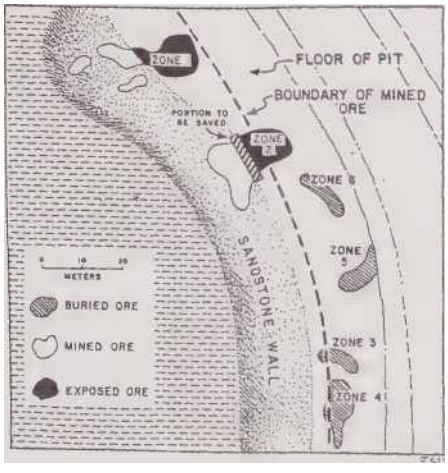
A geological reconstruction of what probably happened involves:

(1) Uranium-bearing Solutions migra- ting through the fractured rocks of the región; and

(2) The precipitation of the uranium as pitchblende and uranite when the Solutions carne in contact with kerogen. A critical mass was formed and a Chain reaction started.

Such a scenario is unlikely today because the concentration of fissionable ^{235}U in natural uranium has declined by a factor of about five in the last 2 billion years. The halflife of $^{23\circ}U$ is only about 700 million years.

(Nagy, Bartholomew; "Precambrian Nuclear Reactors at Oklo," Geotimes, 38: 18, May 1993. Also: Nagy, Bartholomew, et al; "Role of Organic Matter in the Proterozoic Oklo Natural Fission Reactors, Gabon, Africa," Geology, 21:655, 1993)



Six of the 16 known natural nuclear re ctors that once generated heat at Oklo. Lenses of exceptionally rich uranium comprised the cores. These defunct reactors are about 2 billion years oíd.

OKLO: AN UNAPPRECIATED COSMIC PHENOMENON

In 1972, French scientists discovered that several natural concentrations of uranium ore had become critical and flared up some 2 billion years ago at Oklo, Gabon. The concentration and con- ñguration of the natural uranium and surrounding materials at that time had been just right to sustain fission. In fací, the analysis of the nuclear waste in the burned rocks demonstrated that plutoniura had also been created. This implies that natural breeder reactors are also possible, raising the possibility of hitherto unappreciated, long-lived heat sources deep in the earth, in the other planets, and inside some of the stars.

Don't worry that the Oklo phenomenon might occur today on the earth's surface. The concentration of fissionable U-235 has fallen considerably in the last 2 billion years due to its radioactive decay. But, deep inside the earth and other astronomical bodies, nuclear criticality might still be possible due to different pressures, densities, etc.

In a stimulating and generally over- looked paper in Eos, J.M. Herndon profiere four important natural phenomena that may involve natural fission reactors.

•Geomagnetic reversáis. In the deep earth, where pressures and densities are high, natural nuclear reactors may genérate intermittent bursts of heat----------just as they did at Oklo—and thereby cause the earth's dynamo to falter and reverse.

•Planetary heating. Júpiter, Saturn, and Neptune emit much more energy than they receive from the sun. Natural nuclear reactors could be the reason.

•Stellar thermonuclear ignition. Astro- nomers assume that the high tempera- tures required to ignite the thermonuclear reactions powering stars come from gravitational collapse, but this source does not seem adequate to some scientists. Nuclear fission reactors could ignite stars just as they do H-bombs.

•Missing matter. Natural nuclear reac- tors are finicky. There may be many star- sized, non-luminous objects out there that v¡ere never ignited and that we cannot see through our telescopes.

(Herndon, J. Marvin; "Examining the Overlooked Implications of Natural Nuclear Reactors," Eos, 79:451, 1998)

Comments. Two additions to Herndon's list:

•Evolution of terrestrial life. Nuclear reactors produce copious mutagenic radi- ation. They could have accelerated the evolution of life, especially during the Cambrian Explosión. (See vol. 1, p. 185.)

•Thermal plumes. Deep-seated natural nuclear reactors may create the thermal plumes said to be responsible for such surface hot spots as Iceland and Hawaii.

A NUCLEAR REACTOR CORE?

IS THE EARTH'S CORE A NATURAL FISSION REACTOR?

Virtually all known mainstream scientists subscribe to the theory that the heat leaking up from the earth's interior is in part residual heat left over from the planet's formation, with the remainder being heat released by the radioactive decay of atoms in the mantle, such as potassium-40. Despite the simplicity and reasonableness of this model, J.M. Herndon wants to install a natural fission reactor at the earth's core. This reactor would provide not only observed heat but also help explain solve some long- standing geophysical puzzles.

BasicaUy, Herndon posits a spherical fission reactor about 5 miles in diameter composed of uranium-235 and uranium-238. Technicaüy, this would be a fast-neutron breeder reactor. Herndon may have few supporters in the earth-science field, but he can point to some facts consistent with his theory.

•The remains of natural fission reactors have already been discovered in the earth's outer crust at Oklo, in Gabon.

•The geomagnetic field is irregular in shape and has apparently frequently reversed itself over geological time spans. Herndon's seething core of molten metal could generate such a tempermental field as it churns away, sometimes even tem- porarily ceasing operation as accumu- lating reactor poisons shut off the fission reaction, restarting as they dissipate.

•The heüum-3 seeping outward from the earth's innards far exceeds what geophysicists predict from primordial leftovers, but Herndon's reactor would be a sourcé of the overabundance of helium-3.

•Several other solar-system planets and moons are also exothermic and with- out obvious sufficient heat sourceB. Júpiter, Saturn, Neptune, and Jupiter's moon, lo, might also harbor nuclear reactors. Even our own moon might!

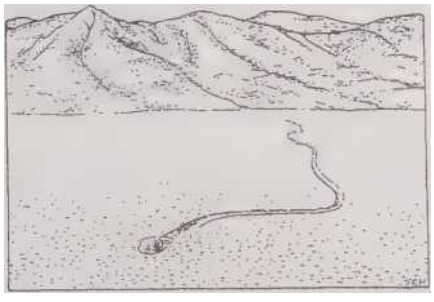
(Lemley, Brad; "Nuclear Planet," Dis- cover, 23:37, August 2002.)

ROCK SL1DERS

WIND-DRIVEN ICE SHEETS IN DEATH VALLEY

Scientists generally scoff at Forteana as beneath their dignity to investígate. But the mysterious moving rocks on Race- track Playa in Death Valley have lured them out of their ivied halls. We quote frora the abstract of a report seen in the mainstream journal Geology.

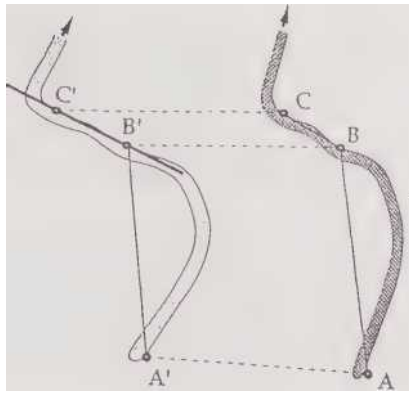
> **Sharply angular boulders as large as 320 kg [700 pounds] sit on the Race- track Playa, Death Valley, California; trails leading to them indícate that the rocks have moved large distances. The process has never been witnessed. Although high winds and a wetted surface seem necessary, controversy persists about the need for other conditions, especially ice sheets. On the basis of experiments with. a wetted Racetrack surface (soft mud ~ 3 cm deep), we find the effective coef- ficient of friction to be surprisingly high, ~0.8. Movement by wind alone of moderate-sized (20 kg) rocks with cubic shape requires sustained winds cióse to the ground of ^ 80 m/s (~-180 mph). Larger flat-lying rocks require mueh higher winds.. .**



A sinuous, 250-meter-long trail left by a sliding rock at Racetrack Playa.

The authors of this paper, J.B. Reid, Jr., et al, precisely mapped a large num- ber of the enigmatic tracks. Their maps revealed many "mated pairs" of rocks, whose curving tracks matched near their origins to within a few centimeters, even though the tracks were separated by up to 830 meters (over 0.5 mile!). Apparent- iy these mated rocks were locked into a huge ice sheet resting------almost floating —on slippery mud. Sustained winds blowing over the large areas of ice generated enough horizontal forcé to propel the ice sheets with their cargos of rocks. Measurements showed that some of these ice sheets had to be at least 850 x 500 m (~100 acres!) in extent. That's big, to be sure, but hardly anomalous.

(Reid, John B., Jr., et al; "Sliding Rocks at the Racetrack, Death Valley: What Makes Them Move?" Geology, 23: 819, 1995)



Two of the parallel tracks of rocks on Racetrack Playa. The parallelism suggests that the rocks were once embedded in the same ice sheet.

Comment. If scientists would spend as much effort on marine light wheels and UFOs as they do on sliding rocks, we anomalists wouldn't have so much to write about. It's all a question of what is "academically respeetable."

THE WORLD'S LARGEST "PLAYA- SLIDER" FDRROW

Most studies of playa sliders ("moving rocks") have been eonducted at Racetrack Playa, near Death Valley, California. There one finds good-sized rocks at the ends of long tracks they have made when some forcé has propelled them across the fíat playa surface. What has moved these rocks, some of which weigh 700 pounds? The current consensus holds that wind is the motive forcé, but that it is inadequate to move the rocks directly. Instead, the wind acts upon sheets of ice in which the rocks are frozen. As these sheets of ice are moved across the playa, the keels of the frozen-in rocks leave those curious trails that have intrigued Forteans for many decades.

Playa sliders have also been found at Magdalenasmeer Playa in South Africa, and in Nevada and Tunisia. In a recent issue of Geology Today, C.C. Reeves, Jr., Texas Tech University, adds to the list a playa, at Double Lakes, Texas.

Of special interest at Double Lakes is not the rocks and other debris blown across the playa but a discarded hot- water tank. It, too, is a playa süder.
It first left a trail a few hundred meters long When it was frozen in an ice sheet spigot down, with the spigot furrow quite obvious. The ice sheet then melted, and the tank was blown over spigot-up. Another ice sheet formed, and the tank was off across the playa again. This time the keel of the tank excavated a furrow as wide as the tank's length,

> **91 centimeters, several centimeters deep, and 122 meters long. Reeves contends that this is the world's largest playa- slider furrow!**
>
> **(Reeves, C.C., Jr.; "Unusual Playa Sliders at Double Lakes, Texas," Geology Today, 12:207, 1996)**

Comment. Now that Fnencr has fínally stooped to study this mundane phenomenon and has come up with some answers, we are inclined to remove it from the rolls of Fortean phenomena!

ROCK SLIDERS AT RACETRACK PLAYA, DEATH VALLEY, CALIFORNIA

No one has ever seen the famous sliding rocks on Racetrack Playa actually slide. But slide they do, as proven by the long, apparently chaotic, trails they leave on the playa's mud surface. Some of the moving rocks weigh upwards of 700 pounds, so this is not a trivial joke of Nature. But some rocks refuse to move at all, while many travel helter- skelter for hundreds of yards.

Many scientists have gravitated to Racetrack Playa to look for the forcé that propels these rocks so erratically.
The latest to enter the lists is geologist P. Messina from San José State Univer- sity. Now, we add her thoughts to those we have recorded above.

All researchers agree that wind, which can be fierce at the playa, is the prime mover. Water, too, is an agreed upon ingredient, for it makes the clay surface so slippery it is sometimes hard to remain vertical. The debatable variable is ice. Even in Death Valley, at the playa's altitude, winter rains can lead to ice sheets on the playa. The thought is that the ice helps buoy the rocks a bit and gives the wind a much larger sur- face to work with. If the ice theory is correct, one would expect to see coordi- nated trails (i.e.; parallel) of those rocks locked into the same ice sheets. Some claims to this effect have been made. (above) Messina, however, sees only chaos.

.

> **In analyzing their massive cóBection of data, her team made some dramatic discoveries, not the least of which was that the phenomenon demonstrates an almost total lack of order. There seems to be no general rule for how the rocks move, either on their own or in relationship to one another.**
> **Also Messina found no relationships among the rocks' size, shape, composition, or weight and the type of motion (straight versus curvy) or distance traveled.**

The word "chaos" seems appropriate for the moving rocks given Messina's findings. The playa mystery survives.

(Darack, Ed; "The Moving Rocks of Death Valley," Weatherwise, p. Í9, January/February 2003. Cr. P.A. Robería)

Comment. Equally mysterious moving _ rocks are found in South Africa, Tunisia, and Nevada. At Double Lakes, Texas, a discarded water tank emulates the sliding rocks, although ice does seem to be a vital element in this case.

CLIMATE PHENOMENA

WHEK THE ARCTIC WAS WARM

According to the anthropologists' scherture of hominid diffusion aeróse the planet, the Ice Ages blocked most éast- west travel at high latitudes until about 12,0 years'ago. This date now seems far off the mark. A team of Russian and Norwegian archeologists has located a hominid camp at Mamontovaya Kurya in Russia on the Arctic Circle. Bones of horses, reindeer, and wolves were strewn about this Paleolithic camp.

Most important of all, though, was a 4-foot mammoth bone bearing groovés made by sharp stone tools-----a sure sign of human occupation. The mammoth bone has been dated as 36,000 years oíd. This is the earliest sign of hominid presence in the high Arctic.

You will notice that we use the word "hominid" rather than human, because the campers may have been Neanderthals. No hominid bones were found to resolve " this matter,

The implication of all of this is that, although the Arctic may have been very coid 36,000 years ago, it was largely ice-free.

(Pavlov, Pavel, et al; "Human Presence in the European Arctic Nearly 40,000 Years ago," Nature, 413:64,2001. Wilford, John Noble; "New Evidence of Early Humane Unearthed in Russia's North," New York Times, September 6, 2001. Cr. D. Phelps.)

Comment. A nearly ice-free Arctic some 40,0 years ago might have permitted human diffusion into the New World, but so far we have seen nothing this early.

It is likely that the Southern Hemisphere was also freer of ice during this period. Although humans had gained Australia by this time, we know of no good evidence that they used Antárctica and the islands of the Southern Ocean to reach the New World.

WHEN THE ANTARCTIC WAS WARM

The analyses of ocean-floor sedimente deposited recently by melting Antarctic ice sheets reveal that these ice sheets are only about 2,000 years oíd. The evidence is in the rocky debris scraped up from inland Antárctica and then transported out to sea, where it drops to the sea floor as the ice melts. The grains of rock settle into the ocean sediments which contain biological debris that can be carbon-dated. (Marine life beneath the ice sheets is surprisingly abundant and varied despite the near-freezing temperaturas.)

A somewhat politically incorrect observation appears in this article.

> However, the news that the Antarctic Peninsula's ice shelves may have come and gone at least once since the end of the last ice age, about 11,000 years ago, suggests that people may not be fully to blame for the dis- appearance now underway.

Supporting foregoing evidence are studies of Antarctic lake sediments and ancient abandoned penguin rookeries. Everything points to a warmer, more humid Antárctica between 2,500 and 4,0 years ago.

(Perkins, S.; "Antarctic Sediments Mud- dy Climate Debate," Science News, 160: 15Q, 2001)

Comment. The warmer Antarctic just portrayed might explain those oíd maps, such as that of Piri Re'is, that seem to depict a relatively ice-free Antárctica.

The more daring of us might postúlate sea commerce between South America, Southern Africa, and Australasia during those haleyon days!

GLOBAL COOLING HAS BEGDN!

G. Bónd of the Lamont-Doherty Earth Observatory and his colleagues have been tracking the movements of past ice sheets usiñg the trails of rocky debris they leave behind on the ocean floor. A type of igneous rock called "gabbro" is indicative of the passage of past ice sheets. For example, 100,000 years ago, when the last ice age began, the amount of gabbro in ocean-floor sediments jumped from 2% to 8%. Despite all today's furor over global warming, Bond et al are finding in current ocean sediments the same gabbro precursors. Conclusión: a new ice age is in the making.

(Anonymous; "Big Freeze," New Scientist, p. 21, December 20/27, 1997)

SIX IMMENSE ARMADAS OF ICEBERGS INVADED THE NORTH ATLANTIC

> Observations of large and abrupt climate changes recorded in Green- land ice cores have spurred a search for clues to their cause. The search has revealed that at six times during the last glaclation, huge armadas of icebergs launched from'Cañada spread across the northern Atlantic Ocean, each triggering a climate re- sponse of global extent.

The foregoin'g abstract does not mén- tion the interesting Heinrich layers that fostered the above scenario. In 1988, H. Heinrich published a paper de- scribing a curious set of sedimentary layers found in cores drilled in the tops of the Dreizack seamounts in the eastern North Atlantic. Heinrich conclud- ed that each of the six layers he found represented the melting of "six great armadas of icebergs." These icebergs carried debris picked up in Cañada and, as they melted, deposited it on the seamounts and ocean floor. Each layer could be correlated with the major climate boundaries revealed by the Greenland ice cores.

(Broecker, Wallace S.; "Massive Iceberg Discharges as Triggers for Global Climate Changes," Nature, 372: 421, 1994)

GREEN MISCONCEPTIONS

More trees are better for the environ- ment. The Kyoto protocol recommends that we should all plant more trees, because trees help remove carbón dioxide from the atmosphere. CO_2 is a green- house gas, and its reduction should slow global warming. At least, this is how the Kyoto logic went.

More trees may be good for the environment in the tropics, but the reverse is true in lands that are covered with snow most of the year. This is be- cause snow reflecta much of the impin- ging solar energy back into space. If these northern lands were heavily fores- ted, much of the solar energy would be absorbed and converted into heat. Cli- mate-modellers confirm that sunlight- reflecting snow is better for the environment than trees.

(Anonymous; "Reflect on It," New Scien- tist, p. 19, May 13, 2000)

Hydroelectric power is elean. Although widely proclaimed to be among the cleanest energy sources available, some hydroelectric powerplants actually contribute more greenhouse gases than large coal-fired plants!

Submerged vegetation is the problem. When it decays, it releases greenhouse gases---in quantity. The forests first submerged by the reservoirs behind the dams contribute gases for only a few years. Most of the troublesome biomass is fed into the reservoirs from upstream. Compounding the problem are the vast areas of stagnant water behind many hydroelectric. dams. There, in the ab- sence of dissolved oxygen, the rotting vegetation generates methane, which is a much more potent greenhouse gas than COg.

(Pearce, Fred; "Raising a Stink," New Scientist, p. 4, June 3, 2000)

Chapter 5

GEOPHYSICS

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LUMINOUS PHENOMENA

LIGHTNING

Most lightning is the rapid, concentrated discharge of electricity from cloud-to-ground. But theré are many puzzling, often bizarre exceptions. Thundercloud-to-ionosphere discharges are examples of such deviant forms of lightning. (These are described immediately below.) We also recognize here two additional categories of non-standard forms and effects of lightning. (Note that “ball Hghtning" has the entire following section devoted to it.)

•Thundercloud-to-ionosbhere electrical discharges. Sprites, elves, etc.

•Some odd manifestations of lightning. Curious afterglows, lightning loops, gamma-ray flashes.

•Some curious effects of lightrrtnq. car-stallings, strange human physio- logical phenomena, those so-cal]ed "pranks."

See our catalog Remarkable Luminous Phenomena for many more anomalies and curiosities of lightning.

THUNDERCLOUD-TO-IONOSPHERE ELECTRICAL DISCHARGES

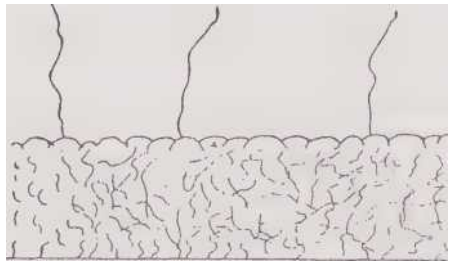
ROCKET LIGHTNING

The following testimony carne from a pilot aloft near Amarillo, Texas, who had a good, high-altitude view of an approaching coid front that was spawning many lightning discharges.

> **Most of these lightning flashes were typical, occurring either inside of the clouds or with their bright channels visible. However, as I approached the front and the individual bolts could be seen in more detail, I became aware that approximately every 50th or lOOth discharge would go from the top of a cloud vertically upwards through the clear air toward the iono- sphere.**

(Vaughan, Otha H., Jr., and Vonnegut, Bernard; "Lightning to the Ionosphere," Weatherwise, 35:70, 1982)

Comment. Although we have accumulated many similar observations of upwardly directed lightning ín Remarkable Luminous Phenomena, it wasn't until about 1990 that this subject became scientifícal- ly respectable. Now, several varieties of such lightning are recognized: "sprites," "elves,", and "blue jets." See later entries.



A pilot's sketch of "rocket lightning" risíng toward the ionosphere from the top of clouds presaging an approaching coid front.

MYSTERY LIGHT FLASHES ABOVE THUNDERSTORMS

Past issues of Science Frontiers have recorded séveral examples of anomalous luminous phenomena abpve cloud tops (See above for exampié). Almost all of these observations have been anecdotal and too qualitative to be of use to scien- tists. Happily, some atihospheric scien- tists are now taking more interest in "rocket lightning" and those strange light flashes seen above storm clouds. First, though, one more anecdotal report, and then we'li summarize two recent scientific efforts to elucídate these phenomena.

July 28, 1993. 150 miles south of Panama. From an aircraft flying at 33,000 feet.

> **I and another pilot in the cockpit of American Airlines Flight 912 were watching and circumnavigating a large cumulonimbus cloud. About five times, a large discharge of lightning at the top of and within the cloud was followed by a vertical shaft of blue light that propagated from the top of the cloud upward to 100,000 ft.**
>
> **The beam was very straight and the color distinctly different from the lightning. At the top of this shaft, the column fanned out just before its disappearance. AH the occurrences were identical. At least one also was witnessed by three other American pilots about 30 min. behind us on the same route.**

(Hammerstrom, John G.; "Mystery Lightning," Aviation Week, 139:6, August 30, •1993. Cr. J.S. Denn and D.K. Hackett)

July 1993. From an aircraft over the American Midwest.

E. Wescott and D. Sentman, employing a very sensitive camera aboard a NASA DC8, recorded 19 unusual flashes over a thunderstorm. Each flash lasted less than 1/30 seeond. ‘ ■

> **The scintiUations are estimated to be about 25 miles taU, 6 miles wide and more than 240 cubic miles in volume, according to Eugene Wescott and Davis Sentman.**
>
> **Their shapes resemble resemble jeHyfish, Wescott said. "They appear brightest where they top out, typi- caUy about 40 miles high, so you have the jeHyfish body at the top with tentacles trailing down."**

The nature of these flashes is unknown. Wescott and Sentman ventured that they might be a type of glow discharge.

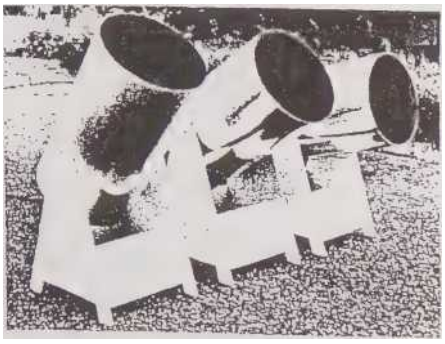
**(Sawyer, Kathy; "NASA Captures Image of Mysterious 'JeHyfish" Flash," Washington Post, September 24, 1993. Cr.
S. Reyes. Shorter versions of the Post article also appeared in the Phüadelphia Inquirer, September 25, 1993. Cr. T. Shelton. Also: the DaUas Morning News, September 24, 1993. Cr. L. Anderson.)**

September 22-23, 1989. SoutheaBtern North America.

Anomalous flashes were detected above Hurricane Hugo by Minnesota-based SKYFLASH equipment. Hurricanes, of course, are often accompanied by thun- derstorm activity.

Said apparatus consista of three phot- metric telescopes using photomultiplier tubes with 19-inch parabolic mirrors.

A variety of light pulses appearing in the night sky have been recorded during SKYFLASH surveys. The most puzzling types of flashes were the "long", events, which lasted about 20 miHiseconds, with slow rises and faUs. During the "long" flashes, no sferics (radio disturbances) are detected, whereas the more common shorter flashes are accompanied by sferics. However, during Hurricane Hugo, these mysterious "long" flashes occurred much more frequently than usual. The origin of the "long" flashes remains unknown.

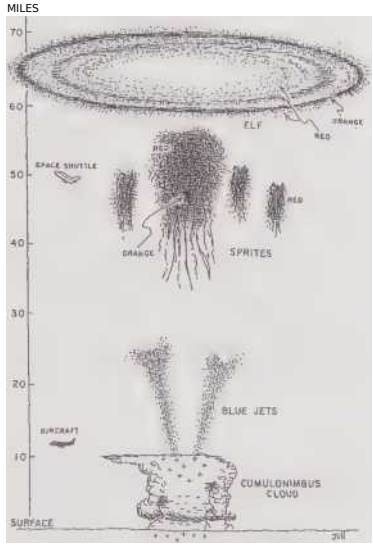


SKYFLASH photometric telescopes provided scientifically convincing evidence of luminous phenomena rising above thunderclouds.

(Winekler, J.R., et al; "Fast Low-Level Light Pulses firom the Night Sky Observed with the SKYFLASH Program," Journal of Geophysical Research, 98:8775^ 1993)

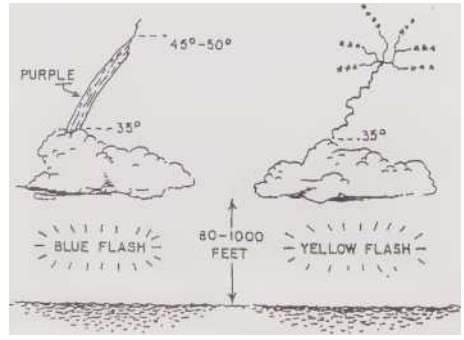
Comment. The "Ught rays," the "jeHy- fish,'[1] and the "long" flashes may be different aspects of the same pheno- menon. In any case, some sort of un- recognized electrical activity is tran- spiring between storm-eloud tops and the ionosphere. See later "entries.

Comment. The blue jets may be related to other controversial phenomena that suggest surface-to-ionosphere electrical diseharges, such as mountain-top glows and low-level auroras, as presented in our catalog Remarkable Luminous Phenomena.



Composite sketch of three currently recognized luminous phenomena that sometimes rise from the tops of thunderclouds.

Comment. Two other frequently observed electrical diseharges between the earth and ionosphere are not yet widely recognized ----------even denied----by Science: (1) mountain-top glows, such as the Andes Lights; and (2) Low-level auroras.



These two types of cloud-to-inosphere diseharges remain unnamed and unrecognized. They were observed over the North Atlantic in 1967.

SOME ODD MANIFESTATIONS OF LIGHTNING

"BLDE JETS" EMITTED ÜPWARD FROM TOPS OF THUNDERCLOUDS

Geophysicists have recently recognized that something very strange transpires above thunderclouds. First, there is the phenomenon we have called "rocket lightning" in our books and newsletters. Scientists now cali these upwardly direeted diseharges "sprites." (vol. 1, p. 240) The sprites are short-duration red flashes in the ionosphere, sometimes with bluish tendrils extending down into the thunderclouds. Second, there are the newly recognized "blue jets," a new class of upwardly direeted diseharges. This new phenomenon is detailed in a paper by E.M. Wescott et al. Here is their abstract:

> **Initial observations of as newly documented type of optical emission above thunderstorms are reported. "Blue jets," or narrowly collimated beams of blue light that appear to propágate upwards from the tops of thunderstorms, were recorded on B/W and color video cameras for the first time during the Sprites94 aircraft cam- paign, June-July 1994. The jets appear to propágate upward at speeds of about 100 km/s and reach terminal altitudes of 40-50 km. Fifty-six ex- amples were recorded during a 22- minute interval during a storm over Arkansas. We examine some possible mechanisms. but have no satisfactory theory of this phenomenon.**

(Wescott, E.M., et al; "Preliminary Resulta from the Sprites94 Aircraft Cam- paign: 2. Blue Jets," Geophysical Research Letters, 22:1209, 1995)

GIANT ELECTRICAL JETS FLASH UP INTO THE IONOSPHERE

After decades of denial, mainstream geophysicists have finally recognized some of the rare luminous phenomena connec- ting the tops of thunderclouds to the ionosphere high above them. These are the sprites, elves, and blue jets you hve probably read about in the popular press. They represent electrical "leak- age" across a 100,000-foot gap between the earth's surfaee and the ionosphere. These three luminous phenomena are now officially recognized as part of the ' "global electrical Circuit."

But there are other electrical phenomena bridging this 100,000-foot gap. In the June 26, 2003, issue of Nature, H.T. Su et al describe a robust, new type of electrical current flow between thunderclouds and the ionosphere. Using low- light-level cameras emplaced on the Southern tip of Taiwan, they recorded ñve "gigantic jets" emanating from a thunderstorm raging over the South China Sea near the Philippine island of Luzon 400 kilometers distant. The date was July 22, 2002. These great jets, which will doubtless also receive faneiful ñames, are shaped like the sprites but propágate upwards' racher thah down- wards. They also emit strong bursts of electromagnetic radiation.

(Su, H.T., et al; "Gigantic Jets between a Thundercloud and the Ionosphere," Nature, 423:974, 2003. Pasko, VictorP.; "Electric Jets," Nature, 423:927, 2003.)

APPARENT CIRCULAR LIGHTNING

May 1, 1997-, near Patterson, New Jersey.

■

Between 3 P.M." and 4 P.M., D. Quinlan was driving along Route 80. A dark line squall was approaching from the West. Quinlan observed many horizontal strokes of lightning passing from cloud to cloud. These diseharges seemed to make little noise---no loud crashes of thunder, although sounds were somewhat muffled by his vehicle. These strokes moved so slowly that their progress across the sky could be easily tracked visually. Most remarkable were three diseharges that began to his right, progressed across the sky in nearly a horizontal plañe, and then looped baek to near their starting points, • thereby completing what appeared to be a circle.

(Quinlan, David; prívate communication, May 2, 1997)

LOOPING LIGHTNING

March 17, 1992. Delta Flight 1083 en-route from Pittsburgh to Atlanta.

At approximately 8:30 PM, this flight was thought tó be flying safely high above thundercloud tops, which were situated at 20,000-22,000 feet. The pilot, W.F. Blanchard, describes what he observed:

> **Then, from one of these clouds,' a lightning bolt appeared that changed my mind instantly. This bolt carne**

from the top of the buildup olosest to our line of flight and formed an enormous loop in the sky. It started at the top of the eloud and went well above our altitude (to at least 40,000 45,0 ft.) and then circled back down into the eloud. My impression is that it joined back into itself at the top of the eloud, but it may have returned to another of the peaks in the same eloud.

(Grynkewich, N.E., Jr.; "Lightning Loop," Weather, 47:493, 1992)

Comment. There have been numerous recent reports of upwardly directed "rocket" lightning, but none in which the lightning returned back to the same eloud. Grynkewich may have seen some bizarre form of intercloud lightning.

POST-LIGHTNING GLOWS

The following observation was recently (1993) posted on a Computer bulletin board by Rodney Jones. The printout was submitted to Science Frontiers by M. Epstein.

> We were in the deep Erench countryside a few weeks ago, and during our stay, we had two spectacular thunderstorms. One lasting three hours and one lasting six hours.
>
> One of the attributes of this particular area (halfway between Cahors and Agen) is the dark night skies—right down to the horizon (I saw constellations low in the Southern sky that I'd only seen on star charts).
>
> On the occasion of the six-hour storm (which started about eight thirty in the evening), whenever the rain abated, we went outside and watched.
>
> During a total of approximately 1 hour of watehing, I observed phenomena I had never (consciously) seen before. Following ground strikes (probably over the horizon), on at least eight occasions, the ground end of the strike (i.e., on the horizon) would be glowing for anything up to thirty seconds.
>
> On one particular occasion, my brother was recording the proceedings with a camcorder. I saw a big ground strike followed by a glow on the horizon. I was trying to direct him to that spot, when there was another ground strike 5-10 degrees to the right of the glow; then, maybe a second later, the original glow erupted into a brilliant point of white light that Ut up the sky.
>
> I was gratified to find that we had this captured on video, although the glow from the first strike can't really be seen.
>
> Does anyone know what we were seeing here? Has anyone seen either of these phenomena cióse at hand?

A BÜRNING BUSH SPROÜTS A LIGHTNING LEADER

Summer 1965/1966, Onslow, Western Australia. Á meteorological offícer had been observing spectacular lightning with many cióse ground strikes from two cumulonimbus (Cb). He wrote further:

> At about 8.15 p.m. I left the office to drive from the aerodrome into Onslow. The second Cb was now over- head and it too had its moment of interest for me. Just after exiting the aerodrome gate, suddenly to my right a low bushy shrub alongside the road burst into fíame, then a fine snaking leader thrust skyward from it, to be replaced by a downward thunderbolt. The latter forked the road immediate- ly across the front of my car, the right-hand fork blowing the burning bush to bits. It was stunning to say the least.

(Robertson, Clive; "Distant Rumbles and Close-üp Flashes," Weather, 58:46, 2003)

GAMMA-RAY FLASHES IN THE ÜPPER ATMOSPHERE

Something strange is definitely going on in the upper atmosphere, particularly above thunderstorms. We have already reported above on the mysterious light flashes and radio emissions (p. 265). Now, we record similar, possibly inti- mately related flashes of energy in a different portion of the electromagnetic spectrum.

> Detectors aboard the Compton Gamma Ray Observatory have observed an unexplained terrestrial phenomenon: brief, intense flashes of gamma rays. These flashes must origínate in the atmosphere at altitudes above at least 30 kilometers in order to escape atmospheric absorption and reach the detectors.

The energies of the gamma rays in the flashes are very high. They are typical of the braking radiation (Brems- strahlung) from 1,000,000 electron-volt electrons. Since most of the gamma flashes origínate over regions where thunderstorms are frequent, it is temp- ting to associate them with lightning. Ordinary lightning, however, is not energetic enough to generate the gamma flashes and, of course, it does not occur above 30 kilometers altitude anyway. G.J. Fishman et al, who reported on this new phenomenon in Science, specu- late that some hitherto unrecognized, high altitude electrical discharges occur high above areas hosting thunderstorms. Possibly, upwardly directed lightning ("rocket lightning") is involved in aH three of the newly found flashes in the radio, optical, and gamma portions of the electromagnetic spectrum.

(Fishman, G.J., et al; "Discovery of Intense Gamma-Ray Flashes of Atmo- spheric Origin," Science, 264:1313, 1994. Kerr, Richard A.; "Atmospheric Scien- tists Puzzle Over High-Altitude Flashes," Science, 264:1250, 1994)

SOME CURIOUS EFFECTS OF LIGHTNING

CAN THUNDERSTORMS STALL CARS?

Some UFO reports aver that the pre- sence of luminous phenomena (inter- preted as alien vehicles) have staUed automobile engines. Here foUows an un- sensational report, sans UFOs, but with identical consequences.

July 20, 1992. Near Valognes, France.

A. Lunt and O. WhaUey were driving a Citroen 2CV in heavy rain. Lightning in the distance only.

> While the car was four to five metres from the approaehing halt sign with the gears still engaged, the engine cut out. The car was bróught to a stop at the halt sign and when the puzzled men found that the car would not restart they spent some 10-15 seconds wondering what to do. Then suddenly there was a huge flash, described as an 'explosión', only two metres behind and to their right as lightning went to ground in a triangular, graveUed area which formed part of the road junction system. The inside of the car and the surrounding countryside lit up brightly and, simul- taneously, there was a terrifle crash of thunder.• Startled, the occupants stayed in the car for a minute longer without trying to restart the engine before stepping outside to raise the bonnet of the car. The engine appeared dry and there was no dis- cernible reason for its failure. Then, upon getting baek into the car, the engine started at once, since when the vehicle has given no further trouble.

Of course this single incident cannot prove that the powerful electrical .fleld preceding a lightning stroke interfered with the car's ignition. system. This report is suggestive only.

(Meaden, G.T.; "Impending Lightning Stroke StaUs Car Engine?" Weather, 48:29, 1993)

LIGHTNING-STALLED AIRCRAFT

After reading the above case of lightning stalling an automobile, J.S. Denn submitted the foHowing account taken from a NASA publication.

July 9, 1945. Enroute from Maine to the Santa Mane Islands.

As related by First Officer N.A. Pierson:

> We had just taken off from Presque Isle, Maine, and had been in cruise power for 50 minutes, when a lar ge thunderhead cumulus was observed directly on course. Lightning could be seen around the edges and inside the thunderhead. AU cockpit lights were on and the instrument spotlight was fuU on, with the door open. I had just finished Bettlng the power and fuel flows for each engine.

As the ship app'roached the thunder-head, there was a noticeable drop in horsepower and the airplane lost from 180 mph airspeed to 168 mph, and continued to lose airspeed due to power loss as we approaehed the thunderhead... A few seconds before the lightning bolt hit the airplane all four engines were silent and the pro- pellers were windmilling. Simnltane- ous with the flash of lightning, the engines surged with the original power...The Captain and I discussed the reason 'for all four engines cut- ting simultaneously prior to the lightning flash and could not explain it, except for the possibility of a magnetic potential around the cumulus affecting the primary or secondary eircuits of all eight magnetos at the same time.

(Fisher, Franklin A., and Plumer, J. Anderson; "Lightning Protection of Aircraft," NASA Reference Publication 1008, October 1977. Cr. J.S. Denn.)

MYSTEKIOUS MODNTAIN DEATHS

Occasionally, young, healthy hikers are discovered lying dead in the mountains without a mark on them. The answer to this mystery may be in the magnetic pulses created by cióse lightning strikes.

Most deaths from lightning are from direct strikes, side flashes, or ground currents. The ground currents kill by passing up one leg and down the other. Cows sheltering under trees are even more susceptible than humans because they contact the ground in four places! People and animáis electrocuted by these phenomena bear burn marks and other clues pointing to the cause of death.

As for those "mysterious mountain deaths," M. Cherington and colleagues at the Lightning Data Center, Denver, suggest that these unlucky individuáis may have been zapped magnetically. Lightning strikes can create electrical currents as high as 100,000 amperes in rocks and soil. These, in turn, create intense magnetic pulses that induce small electrical currents in nearby objects, such as hikers. Although small, these internal currents are sufficient to stop heart action—without leaving tell-tale signs.

(Anonymous; "Mystery Mountain Deaths and Lightning," Journal of Meteorology, U.K., 23:230, 1998)

BIZARRE PHYSIOLOGICAL EFFECTS OF LIGHTNING

July 1969. Lawson, Missouri.

Lightning is unpredictable and produces rrany weird effects, but the foliowing case pushes the weirdness envelope.

An electrician was driving home through an intense rainstorm that was accompanied by severe lightning. He parked his truck outside his house. Then it happened:

> **As I started up the drive, I took about three or four steps, and then it was as though I had stepped into a very soft cotton ball. My whole body felt as if my head was behind my shoulders and being pulled down between my shoulder blades.**
>
> **When he awoke, he was about 50 feet away on the other side of a fence and on his neighbor's property. His boots had been knocked off. The coins in his pocket and his belt buckle had melted.**
> **A visit to a doctor proved that he had been struek by lightning, and that his spine had been severely damaged.**
>
> **Much stranger was his reaction to the ambient temperature. He was now impervious to coid. He was most comfortable between -10° and 0°F. His normal body temperature was low, just 95.2°, not terribly far from normal. He just didn't feel the coid. He never wore a coat and was comfortable working that way even at -23°F!**
>
> **The electrician is far from being disabled. He even poses for photographs in the snow wearing just shorts and a T-shirt. He is now Publicity Director for a group called Lightning Strike and Electrical Shock Survivors International.**

(Sunlin, Mark; "An Unusual Case of Lightning 'Vietimization'," Journal of Meteorology, U.K., 23:309, 1998)

WHITE STREAK FROM A TV SET

1975. Walsall, WeBt Midlands, U.K.

N. Boynton and his mother were watching TV, when:

> **In the run up to an approaching daytime thunderstorm when the air was 'heavy', and while watching televisión, a streak of whitish light ap- proximately four inches (100 mm) thick carne from the direction of the televisión straight into the body of the room at about head height between where my mother and I were sitting.**
>
> **It lasted for a fraction of a second. There was an accompanying crackling sound, with the televisión flickering and buzzing for a second or two.**
> **There was no evidence of damage to the televisión or anything else in the room. We were unaware of whether there was a lightning strike outside at the time.**

The streak passed between Boynton and his mother, seated about 4 feet apart, and seemed directed toward the door of the room.

(Boynton, Neil; "White Streak from the Direction of a TV Set Prior to a Thunderstorm ," Journal of Meteorology, U.K., 21:348, 1996)

UPLIFTING MAY BE HAZARDOÜS

> **Two women were killed by lightning when the metal in one of their under-wire bras acted like a conductor, a London inquest was told Wednesday. Sunee Whitworth, 39, and her friend Anuban Bell, 24, were killed Sept. 22 in a city park. Iain West, a patholo- gist, said the metal had melted.**
> **"They were enveloped in a massive amount of energy," he said.**

(Anonymous; "Bra Conducís Lightning; 2 Women Killed," Chicago Sun-Times, October 28, 1999. Cr. J. Cieciel.)

BALL LIGHTNING

Ball lightning is one of Nature's more mysterious manifestations. Basically, ball lightning is a mobile, luminous mass, usually spherical in shape, that accompanies such violent natural .phenomena' as thunderstorms, tornados, and earthquakes. it is a rare natural phenomenon, but widely recognized as having sclentiflc substance. However, it lacks a consensus explanation, although the theories are multitudinous.

Since Volume 1 appeared ¡n 1994, we have amassed scores of new cases that máy be ball lightning; some are oíd, most are new. They exhibit such a wide spectrum of characteristics that finer classication seems fruitless. Therefore, they are presented In chronological order of appearance in the literature.

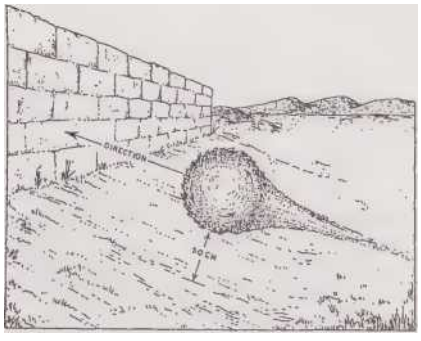
FIREBALL ROLLS OVER THE WATER

While most of today's scientists disdain observations exhumed from the older literature, there is no reason to suppose that our ancestors were not careful observers and accurate reporters. They may even have been better percipients than we are because they were not stifled by today's paradigma that tell us what we are supposed to see! With these thoughts in raind, here follows a wonderful oíd sighting, couched in the terminology of its time, but still pro- viding interesting detail.

> **Analogous to the discharges described as globular lightning, are the flre-balls, so often noticed, about which there has been no little scepticism; but the evidence cannot reasonably be doubted, that displays of electrical light have repeatedly occurred, conveying the impression of balls of fire to the observer. An instance is given by Mr. Chalmers while on**

the Montague, of seventy-four guns, bearing the flag of Admiral Chambers. In the account read to the Royal Society, he states, that "on November 4, 1749, while taking an observation on the quarter deck, one of the quarter masters requested him to look windward, upon which he ob- served a large ball of blue fire rol- ling along on the surface of the water, as large as a millstone, at about three miles' distance. Before they could raise the main tack, the ball had reached within forty yards of the main chains, when it rose perpendicularly with a fearful explosión, and shattered the maintopmast to pieces.

(Wright, Caleb; Wonders of the Earth and the Heavens, Boston, 1856, p. 725. Cr. B. Greenwood.)



Ball lighting is also known to roll along the ground. This case from 1920, seen near Johannesburg, South Africa, had a comet-like tail. The apparition exploded when it hit the stone wall.

CURIOUS PHENOMENON IN VENEZUELA

The description of a truly remarkable phenomenon recently appeared on Scien- tifie American's web page. It also sur- faced in an article by G.D. Kaswell in the journal Infinite Energy. These re- appearances in the eurrent literature of this well-known anecdote allow us to re- visit it here. It is well worth repeating, even though many anomalists have had it in their collections for decades. (In- fact, we recorded it in 1974 in vol. G1 of Strange Phenomena.)

As you read the following quotation from an 1886 issue of Scientific American, remember that the event described oc- curred almost a decade before the dis- covei'ies of X-rays and radioactivity. Although ball lightning was recognized in 1886, the first UFO flap was still 70 years in the future!

> The following brief account of a recent strange meteorological occuri'ence may be of interest to your readers as an addition to the list of electrical eccentricities:
>
> During the night of the 24th of October last [1886], which was rníny and tempestuous, a family of nine ' persone, sleeping in a hut a few leagues from Maracaibo [Venezuela], were awakened by a loud humming noise and a vivid, dazzling light, which brilliantly illuminated the interior of the house.
>
> The occupants, completely terror stricken, and believing, as they relate, that the end of the world had come, threw themselves on their knees and commenced to pray, but their de- votions were almost immediately inter- rupted by violent vomitings, and ex- tensive swellings commenced to appear in the upper part of their bodies, this being particularly noticeable about the face and lips.
>
> It is to be noted that the brilliant light was not accompanied by a sensa- tion of heat, although there was a smoky appearance and a peculiar smell.
>
> The next morning the swellings had subsided, leaving upon the face and body large black blotches. No special pain was felt until the ninth day, when the skin peeled off, and these blotches were transformed into virulent raw sores.
>
> The hair of the head fell off upon the side which happened to be under- neath when the phenomenon occurred, the same side of the body being, in all nine cases, the more seriously injured.
>
> The remarkable part of the occur- rence is that the house was uxxinjured, all the doors and Windows being closed at the time.
>
> No trace of lightning could after- ward be observed in any part of the building, and all the sufferers unite in saying that there was no detona- tion, but only the loud humming al- ready mentioned.
>
> Another curious attendant circum- stance is that the trees around the house showed no signs of injury until the ninth day, when they suddenly withered, almost simultaneously with the development of the sores upon the bodies of the occupants of the house.
>
> This is perhaps a mere coincidence, but it is remarkable that the same sus- ceptibility to electrical effects, with the same lapse of time, should be observed in both animal and vegetable organisms.
>
> I have visited the sufferers, who are now in one of the hospitals of this city; and although their appearance is truly horrible, yet it is hoped that in no case will the injuries prove fatal.
>
> (Signed: Warner Cowgill, U.S. Consulate, Maracaibo, Venezuela, November 17, 1886.)

(Cowgill, Warner; "Curious Phenomenon in Venezuela," Scientific American, 55:389, 1886)

The article in Infinite Energy dis- cusses in some depth the reality of ball lightning, the similarities to modern UFO reports, the reliability of anecdotes, and, especially, the nature of the physio- logical effects, which resemble, in some aspects, radiation sickness resulting from exposure to intense X-rays or nuclear devices.

It is also interesting that this anee- dote, long-consigned to "fringe" publica- tions, has now been resurrected in digital form by Scientific American, which is an establishment publication if there ever was one. Kaswell writes to this point as follows:

> My purpose was (in part) to show that mainstream scientists in main- stream publications like Scientific American evalúate the largely anec- dotal evidence for the relatively non- controversial bal! lightning by a dif- ferent and more lenient standard than that they reserve for the highly coii- troversial UFO reports. The Maracaibo case illustrates this beautifully, pre- cisely because the report has aspects similar to both phenomena.

(Kaswell, Gordon David; "Phenomenon in Venezuela: A Documented Case of Unex- plained Radiation Exposure," Infinite Energy, 6:33, no. 32, 2000)

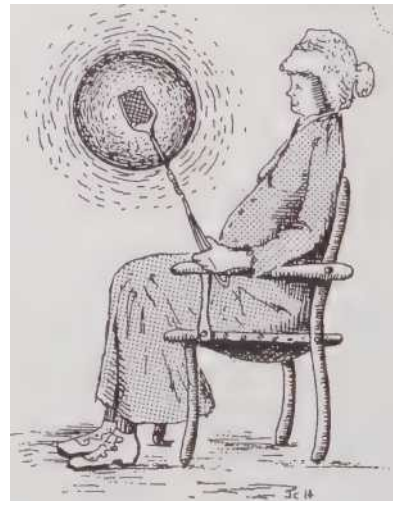
Comment. The conversión of Science archives to. digital form so that they can be accessed on the Web is shallow time- wise. The appearance of this 1886 Ítem is an exception. Much oíd information is being excluded by this transformation of media. In effect, if not intent, it is like the destruction of the Mayan códices by the Spanish priests.

BALL LIGHTNING MATERIALIZES IN A SITTING ROOM

July 24, 1994. Oxfordshire, England.

It was a hot, humid day that produced strong thunderstorms. Some 14 kilo- meters west of Oxford, Mr. and MrB. Langer were in their sitting room when the following sequence ensued:

> 'The storm was almost overhead and I knew the next one would be a cracker, but almost five minutes went by in perfect silence. Tl)e window is very big, almost one wall in glass, and was wide open. My husband and I sat in recliner chairs side by side with our backs to the window. Suddenly a shaft of brilliant light carne over our heads into the middle of the room and seemed to form itself into a white ball as big as a car tyre. It bounced gently upwards and about five feet from the ground it exploded with a terrible noise.'
>
> No rain was falling at the time of ob- servation. The ball was in view for two or three seconds and emitted no



Artist's concept of ball ligrhtmngr that materialized on a fly-swatter inside a screened porch, in Florida 1965.

noticeable heat or odour. It was opaque in appearance and its colour changed from reddish gold to white before it blew up, at which point it was about one metre away from the room's occupants. No traces were left by the ball other than 'some slight brown marks on the carpet', which were all but removed by cleaning.

(James, Adrián; "Ball Lightning in Ox- fordshire, July 1994," Journal of Meteor- ology, U,K. 20:309, 1995)

THE PASSAGE OF BALL LIGHTNING THROUGH GLASS WINDOWS

D.J. Turner has amassed 5315 descrip- tions of supposed ball-lightning events. Among these are 42 cases where the balls apparently bored holes in glass window panes, and 26 where they some- how passed through the panes as if the glass were nonexistent.

By what sort of electromagnetic magic can ball lightning whisk through solid glass without damaging it? The'few eye- witnesses of these events say that this legerdemain is very rapid, and that the ball's shape and motion are unaffeeted. Evidently, we have here cases of electromagnetic induction. Electromagnetic fields penétrate the glass and reconstitute the ball from air molecules on the other side —a sort of Star Trek "transporter." Un- fortunately, this mechanism is a long way from practical use.

In several cases where holes have been found in the glass after the pas- sage of ball lightning, glass dises of • the appropriate size are discovered near- by. (See figure in vol. 1, p. 245) Most of the time, though, dises and glassy residue of any kind are laeking. There is often not even any evidence of glass flow and melting around the edges of the holes.

Turner concludes his lengthy paper with a most unusual case from New South Wales. It seems that a physics teacher arrived early at his - school one stormy raorning to be confronted by a trembling cleaning woman.

> During the storm that raorning she had witnessed a lightning strike on the roof of the school library... After the strike, a fireball danced across the room for several seconds before it disappeared down the side of the b lilding. The lady thought the buil- ding might be on fire and went to check.
>
> As she entered the corridor she found a lens of window glass lying on the carpet. This piece of glass was about 40 meters from where she last saw the fireball. It was not there before the storm.
>
> She showed me the piece of glass. It was about 30 centimeters long on its longest axis and about 12 cm wide at its widest section. The edges were smooth and the finish was similar to that on metal cut out by oxyacetylene. The lens fitted perfectly into the window, whose glass was 5 millimeters thiek.

(Turner, D.J.; "The Interaction of Ball Lightning with Glass Window Panes," Journal of Meteorology, U.K., 22:52, 1997)

BALL OF LIGHT CLOCKED AT 1,800 MILES/SECOND!

August 21, 1996. Sarpy County, NE.

1, 800 miles/second! That's 6,480,000 miles/hour! This speedy phenomenon was captured on video tape by D. Morss and P. McCrone. These researchers were monitoring the top of a thunderstorm with low-light, high-speed video equip- ment, when the ball of light "popped out" of the top of a thundercloud and flashed across their instrument's field of view in 1/10 of a second. Neverthe- less, it was caught on six video frames. Morss commented as follows:

> It's something that you're going to have to scratch your head and think, 'What kind of phenomenon could form this kind of light?'
>
> It's got to be some kind of trapped charge that popped out of the top of a thunderstorm.

(Anderson, Julie; "Ball of Light Leaves Scientists in the Dark," Omaha Morning Herald, December 18, 1996. Cr. L. Farish.)

Comment. Perhaps 1,800 miles per second should really be 1,800 miles per hour. This veloeity would be comparable with that of another very speedy "ball of light."

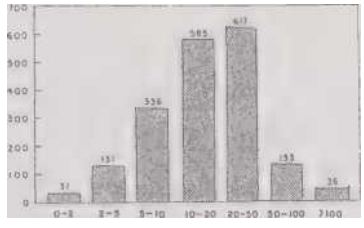
May 25, 1997. Near Loco, Oklahoma.

In what might be called a "video replay" of the above phenomenon, L. Lamphere caught a similar fast-moving "object" near a tornado-spawning storm. He and his team had a digital video camera trained on the storm and were taking time-lapse still photos. Lamphere re- ported:

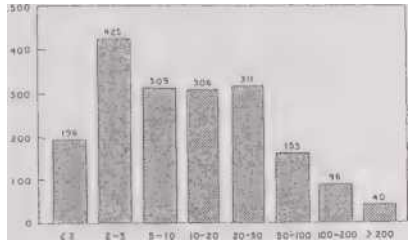
> The oeiling was maybe 900 feet. We were about four or five miles from tiie storm, which was tracking south- cast. The object was well-defined and well-lit, but was obscured briefly by peud clouds. It dipped and bobbled in its trajectory before it flew into a storm known to contain hail the size of baseballs and then reemerged, apparently undamged.
>
> Scientists at the Astrophysics Department at the University of Okla- homa believe the object was solid and may have been traveling between 9,0 and 20,000 mph.

(Anonymous; "Image on Storm Video Raises Questions," Dallas Morning News, June 21, 1997. AP Item. Cr. D. Phelps.)

Comment. Just one high-speed "object" might be dismissed as, say, a photo- graphic artifact. But, when two are caught by cameras imaging violent meteorological events, we must conclude that something unusual is going on.



DIAMETER ICm)



LIFETIME (Sed

Some general characteristics of ball lightning derived from 1836 observations collected in a Russian-Austrian data bank. (Top) Size distribution. (Bottom) hife- time distribution. (From: Stenhoff, Mark;- Journal of Meteorology, U.K., 13:197, 1988)

LIGHTNING STRIKES JET AND POSSIBLY SPAWNS BALL LIGHTNING

June 17, 1996. Tewkesbury, England. *!

On this day, two remarkable observations were made a few seconds apart. Even so, one cannot be certain that the first caused the second.

For the first observation, there were two witnesses. Both saw lightning strike a low-flying ÚSAF jet. Mrs. E. Shobli wrote the following account:

> Two forks of lightning carne from the clouds in front of the plañe, converged on it and gripped it. The tail end of the plañe became illuminated---- vapours carne from its end and formed into a bright, dense mass. I thought
>
> I was witnessing damage to the plañe. The light continued to sepárate from the plañe, downwards like a fiare. It appeared as yellow, lit-up gases. These seemed to take shape, becoming brighter and denser, and then move downwards in the same direction as the plañe (south). About two seconds after disappearing behind the roof there was an ear-splitting explosión. To my relief the plañe reappeared unscathed.

At the time of the lightning strikes, the jet was passing over a factory, where a fork-lift driver saw a dazzling blue-white ball bounce along the factory roof and enter the building. Many wor- kers inside were treated to an amazing pyrotechnic display as the ball made its way through the building.

> It entered the factory through an up- and-over door and was seen as a 'pulsating light' or a 'fiery sphere the size of a tennis ball'. Once inside the building it moved very rapidly for two seconds, following the course of the overhead girders without toueh- ing them and lighting up each girder 'blue, white and orange' as it raced along. It produced what one witness described as 'unbelievable sparks'. Intensely bright, the object illuminated the whole printing works and was seen by about 40 people. After thus racing around the interior of the building for two seconds, the

'fireball' hit a window which glowed orange, and the ball disappeared with a bang so loud that the report was even heard by a deaf worker.

(James, Adrián, and Meaden, Terence; "Ball.Lightning at Tewkesbury, Glos. on 7 June 1996," Journal of Meteorology, U.K., 22:106, 1997)

BALL LIGHTNING COLLIDES WITH CAR

Summer 1991. Southern Bavaria, Germany.

R. Urbanek, a teacher from Wasserburg, recalls her encounter with ball lightning.

I was with a friend in the area of Traunstein. My friend drove a mini- bus.. .150-200 meters... ahead of my car. Golf and se ver al other cars were. following behind me. It (had been) raining with heavy lightning and thunder. I did not drive at normal speed in such a weather.. .Then carne a straight stretch of road with a bi- cycle path to the right, and an open_ - wide field.. .Suddenly I saw a bright green, phosphorescent.. .ball about the size of a medical training ball, that dropped to the ground behind the minibus... It fell to the road and rolled towards me. I knew immediately it was ball lightning, and from school physics I knew a car acts as a Fara- day cage. So I kept my feet to the floor mat and grabbed the wheel with both arms. 3 to 5 seconds passed until the ball reached my car. It carne in a straight line, with a slight deviation to the right (as seen from my position). When the ball caught my car at the right front side,- it gave the vehicle a strong shock or jerk, as if I had driven against an obstacle. All that was on the right
side of me lit up bright green-------the hood, the windscreen, the instrument panel, and even the padding. In the rear-view mirror I could observe that the ball went off the road behind my car. It rolled about 50 meters on the bicycle path, then went into the field and was gone after about 100 meters.

This event was observed by people in the cars behind Urbanek. Later examina- tion of the car found no physical damage, no magnetic anomalies, and no indications of contact with lightning.

(Keul, A.G.; "Ball Lightning-Car Col- lision near Traunstein, Bavaria," Journal of Meteorology, U.K., 22:284, 1997)

BODNCING BALL LIGHTNING

Autumn 1940, Berwyn Mountains, North Wales.

The percipient in this unusual ball-lightning sighting was a Mr. H, who was schoolmaster at Sandyhurst College.

While out walking he was caught in a violent thunderstorm on the side of a hill with a scooped valley below. Ahead of him perhaps 300 feet dis- tant, a bolt of lightning struck a tree with a sharp explosión of noise. Almost immediately a sphere six inches in diameter appeared from the direction of the strike and began to bounce across the ground towards him like a rubber ball. Climbing the hill under its own energy, the object rolled in a parabolic path and hit the ground every ten or twenty feet, climbing up to about three feet in height with each 'rebound'. Every time it hit the ground there was no sound, but a puff of greyish smoke or vapor was emitted. The object got to within about 50 feet of Mr. H befare it suddenly vanished. This al- lowed him to have a good look at it at cióse proximity. He says that it was completely round and was a smokey-grey colour.

(Anonymous; "Ball Lightning in Lanca- shire and North Wales," Journal of Meteorology, U.K., 23:139, 1998)

LUMINOUS TOROID DANGLED SPARKLING "CANDIES"

Ball lightning (BL) may assume many weird forms, which is one reason some scientists claim it is more likely an illusion than physical reality. Those physicists. who admit that BL exists think that some electromagnetic mechan- ism might account for any nicely spheri- cal, luminous globes with lifetimes of just a few seconds, but their equations cannot handle the phenomenon that took place at Gmuend, Austria, in 1996.

A.G. Keul and O. Stummer personally investigated this case. The salient facts are as follows.

A. Reisinger was working in her gar- den about 10 meters from an apple tree when she observed a phenomenon that seems to have been an elabórate and hard-to-explain form of ball lightning.

When the BL appeared suddenly from behind the tree, it caught the atten- tion of the witness who said that it looked like it "sat down on to the tree." It had the dimensions of "a small truek tyre, not as large as a tractor one," and it had a definite torus shape. What made the dark object an even stranger sight was a considerable number of "Xmas candies", all hanging down from its underside 15 to 20 centimetres long and "spark- ling", which means changing bright- ness with an emission of sparks at the same time. A humming and siz- zling sound was associated with the optical effect, but there was no sta- tic electricity. The strange light was not blinding, but irritated the eyes of the witness who looked at it only intermittently. Mrs. Reisinger continued her Work in the shed, not moving closer to the object and get- ting more nervous over the 10 min- utes that the phenomenon lasted. Her eyes started to water towards the end of the observation. Another phenomenon that she remembers was the irregular extinction of the "candies" which went out piece by piece.

(Keul, Alexander G.¡ "More on a Torus Ball-Lightning Case," Journal of Metero- logy, U.K,, 25:49, 2000. The initial report was presented in the same journal, 24:178, 1999)

DON'T STOMP ON BALL LIGHTNING!

Mid-December 1991. Brixham, Devon.

Two- young men aged about 22/23, Mr. Andrew Clark and Lloyd Bieknell, were inside Mr. Clark's cottage when a storm of lightning and thunder began. Suddenly, an orange fuzzy air- borne blob, the size of a football but not perfectly spherical, carne through the wall----so it was said-----and hover- ed at a low level. Lloyd Bieknell lept on to a settee; Andrew Clark jumped on to the lightning ball. This burnt the plástic solé of one of his training shoes and melted a hole some 50 to 70 mm across. The lightning ball was disrupted and "a part of it" went sidew ays and burnt out the trans- former of his C.B. radio (to which was attached a radio mast fixed on the roof outside). The total duration of the event had been about five seconds. Andrew's foot was quite badly burned and he had to go to . the doctor for treatment.

(Anonymous; "Ball Lightning at Brixham in 1991," Journal of Meteorology, U.K., 26:22, 2001)

BALL LIGHTNING GETS SOME SCIENTIFIC RESPECT

Many scientists have doubted the reality of ball lightning, placing it in the same category as UFOs and the Loch Ness monster. But a recent number of the prestigious Philosophical Transactions of the Royal Society devoted 152 pages to seven technical papers on this elusive phenomenon. A couple dozen eyewitness accounts are sprinkled throughout this thick eolleetion of reports. We have room for only two of the more intriguing sigh- tings.

1954, Iowa, account from N. Stouffer.

A glowing ball, about the size of a basketball, fell from the clouds, about twenty feet in front of my car, and to the left side of the road. It bounced about three times, and I was completely amazed by it, when, the next time it touched the earth, it detonated with a noise unlike anything I had ever experienced! My engine quit' coid and I coasted to a stop on the very top of the hill. I was in shock! To my horror, more balls continued to fall around me, some to the side, very cióse...They fell in slow motion. They seemed to have buoy- aney. And when they bounced it was the same kind of motion. Like a bal- loon bouncing. The closest thing to the color of them was a good strike of lightning, cióse by. Bright, but not bright like the Sun. There was movement within a surface tensión. It was like lightning, writhing within a contained area.

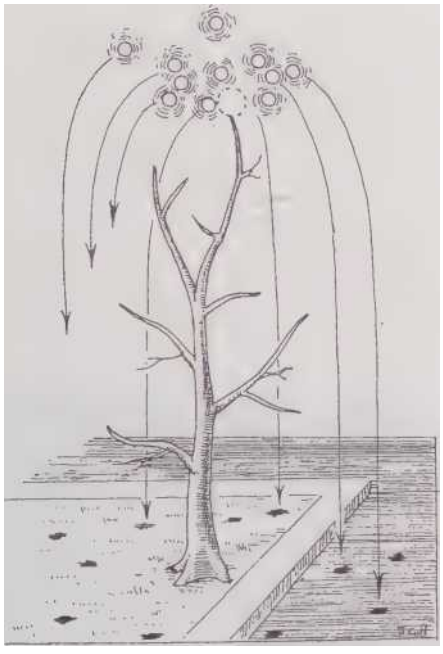
There was no normal lightning at the time. Of extra Ínterest to the anomelist, of course, is the failure of the car engine. (See p. 220.)

June 1972, Kopos, Ukraine, account from V._____N. Nezamaikin.

In the morning I went hunting to a shore of the Dniéper river. The sky

was clean, with no thunderstorm or precipitation. I carne to an open place on the high shore of the Dniéper and noticed a luminescent object 7 m from me in the reeds. It was a hall 100 mm diameter, of a bright blue color. It radiated light like an incandescent lamp of 100-200 W. Its matter, dense in appearance, was swaying, also re- sembling a soap bubble. The hall stayed motionless in the air, 600-700 mm above the grass. Not thinking for long, I made a shot into it with my shotgun. The bullet consisted of lead pellets. The ball's size increased by 1.5 times, and after that it decayed with a bang. It broke into uneven pieces. They dissipated and then dis- appeared near the surface of the water. The whole event lasted for 1-1.5 min.

(Abrahamson, J., et al; "Recently Re- ported Sightings of Ball Lightning," Royal Society of London, Philosophical Transactions, A, 360:11, 2002)



Another case of báll-lightning fragmenta- tion was recordéd at Neustadt, Germany. The ball lighting hit a tree and disinte- grated into many smáller balls.

COMPLEX BALL-LIGHTNING EVENTS

September 24, 2000. Shoreham, England

On this date and November 3, a series of remarkable lightning/ball-lightning events took place along the Sussex coast. We have room for only one of these. The place was 67 Franklin Road, at a semi- detached bungalow. Time: 18:20. Ob- server G. Turner, who was looking south through her kitchen window when an explosión occurred.

> Almost simultaneously, and just to the southeast, what appeared to be a discharge of blue-white lightning descended to earth in the garden immediately to the south of that of her neighbor te the east. This 'light- uin ' was wider, slower moving than normal, and travelled with a zigzag motion. The instant the discharge touched the earth, there was a burst of blue light that rose up from the ground to a height of 4-5 metres, and was at least 18 m across at its widest point. Before the fiare of light had faded, the witness was amazed to see a stream of bright blue light rise from the ground and shoot obliquely NNW in the direction of the rear of her garage where it disappeared from sight. The Southwest córner of the garage is covered by a creeping shrub (clematis), and it was from this that a truly extra- ordinary object emerged a few seconds later. Rushing along the lead seal around the building's roof carne an electric-blue caterpillar- like object, 75 cm (±25 cm) in length, with bright orange sparks continually erupting from its "body." As it pro- gressed, at a high velocity, but easily followed by the eye, the object emitted a erackling/hissing sound like a port-fire or a slow-burning bomb fuse. It executed a right- angled turn from the west to the north side of the garage, then con- tinued on to the northeast córner, where it broke away with a burst of light to climb obliquely through the air directly onto the TV antenna of bungalow No. 65.

(Van Doorn, Peter; "Complex Ball Light- ning Events at Shoreham...," Journal of Meteorology, U■ K., 27:302, 2002.)

STRANGE OBJECT OBSERVED DDRING THUNDERSTORM

August 7, 2002. Near Hertford, U.K.
At the height of an electrical storm.

> This anomaly was observed on the Sele Farm Estate, a semi-rural area between Welwyn Road and North Road, by Andrew Ager. Around 21:30, Mr. Ager was walking home when he saw a "comet-like" object hovering at a height of about 60 cm above the sur- face of the street. The nucleus was a small globe of white light, about the size of a tennis ball; the tapering tail, several diameters of the ball in length was of the same colour, and projected out horizontally. After a few seconds the object moved off along the road, gently oscillating from side to side, leaving a faint gaseous trail and emitting a crackling sound like that of sparks or small pyrotechnics. The witness was a short distance from the phenomenon and was able to follow its progrese for several seconds until it left the road and disappeared in an area of open land heading in the direction of a cemetery 150 metres away. Just before he lost sight of it, s small report of a muffled explosión occurred.

(Van Doorn, Peter; "Torro Ball Lightning División Report for 2002," Journal of Meteorology, U.K,, 28:135, 2003.)

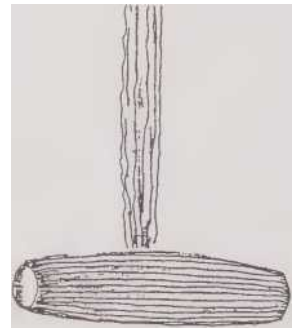
Comment. In Remarkable Luminous Phe- nomena in Nature, we have posted ten additional observations of ball lightning trailing long tails, some of which resemble wavy ribbons!

SMOKEY, CIGAR-CUAPED OBJECT FLOATS ACROSS ROOM

September 24, 2000. Shoreham, West Sussex, United Kingdom. On this date, a complex ball-lightning event mystifíed investigators. Víe can spare room for only one of the many diverse and fasci- nating manifestations of this incredible event.

Mr. and Mrs.D were in their bungalow watching TV, when:

> Mrs. D. saw a bizarre object enter the room directly through the (closed) south-facing window. The appearance of the 'thing' left Mrs. D doubting her senses, for it seemed to pass through the window glass as if this obstacle to its progress did not exist. The phenomenon consisted of a smokey-black object,. shaped like a stubby cigar, and apparently hollow, with whirling streams of smoke rising vertically from its upper surface. The object was small, about 9 cm i 1 cm in length and no more than 2 cm across at its widest point. The whirling smoke streams were very long in comparison, being about 75 cm in height. The object travelled in a straight line, from south to north, at a speed of about 50 cm per second, and at a height of about one metre above the carpeted floor.



Observers' sketch of a smoking, cigar- shaped, possible manifestation of ball lightning. About 3i inches long, it "floated" through an English living room.

Mrs. D. was too startled to note the object' s manner of exit although she re- called an ozone-like smell. Mr. D did not notice the object at all, and their dog was unperturbed! There was no damage.

(Van Doorn, Peter; "Complex Ball Lightning Events at Shoreham, West Sussex, ..," Journal of Meteorology, U.K.; 28: 60, 2003)

SQUISHY BALL LIGHTNING

Ball lightning is noted for its ability to slip through cracks under doors and even pass ("magically") through closed glass window panes. One has to suspect that a novel form of matter is involved —probably a strange form of plasma. Ordinarily, plasmas are simply clouds of equal numbers of ions and electrons. Such plasmas do not exhibit the weird antics of ball lightning. Certainly, we

do not oxpect common plasmas to í>e squishy enough and cohesive enough to squeeze through cracks and keyholes.

J.J. Gilman suggests that ball light- ning might be a plasma containing "Ryd- berg atoms." In Rydberg atoms, the outer electrons have been excited to very high quantum numbers (as high as 10^5 and 10^4!). These electrons may orbit several centimeters distant from their parent atoms, thereby producing, according to Gilman, a "floppy" electrón cloud. A plasma containing a high popu- lation of Rydberg atoms would probably exhibit squishy albeit cohesive proper- ties.

(Ball, Philip; "Squishy Ball Lightning," Nature, 425:253, 2003.)

Cross reference. The FaLL 2003 issue of the Journal of Scientific Exploration ineludes a 61-page article by D.J. Tur- ner entitled "The Missing Science of Ball Lightning." See: www.seientificexplora- tion. org.

MULTIPLE BALL-LIGHTNING EVENT?

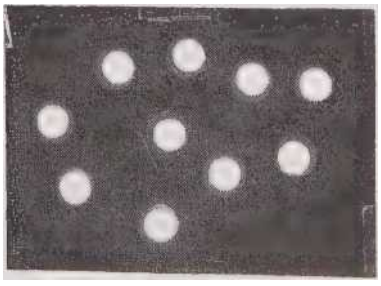
May 8, 2003, Alghero, Sardinia.

An account from R. Hooberman, who was staying at a hotel on the Mediterranean coast. He and his wife were watching a violent electrical storm at sea from their room.

To the Editor of Weather he wrote:

> In the midst of this event I saw a group of ten or a dozen spherical balls of light in three rows and sur- rounded by a sort of halo pass hori- zontally before me at eye level, then disappear. The episode lasted at most three seconds. They were cióse to each other, moving horizontally. It is impossible to assess size and distance with no reference point, but had they each been the size of an orange, 1 would estimate that they were perhaps no more than ten to twelve feet from the window, and that the group was about three feet across, four to five including the halo. I asked my wife who was standing next to me, 'Did you see what I just saw?' 'Yes... they were like a shoal of fish', she replied, which I thought was a very accurate description.

(Stenhoff, Mark; "A Possible Múltiple Ball Lightning Event in Sardinia, 8 May 2003," Journal of Meteorology, U.K., 29:67, 2004)



Sketch showing what may have been a ft^mation of small lightning balls. The dusky halo enveloping them is hará to rertder in this newsletter.

NOCTURNAL LIGHTS

Nocturnal lights are not associated in any obvious way with meteors, electrical storms, or other violent weather. The ñame "nocturnal light" had its origin in the UFO literature, but most of the phenomena we class as nocturnal lights have terrestrial origins, such as the will-o'-the-wisps and the Marfa Lights.

The "classical" nocturnal lights are flame-like or globular in shape with sizes from an inch to many feet in diameter. Their colors span a wide spectrum. A key diagnostic is erratic motion. Some observers are seduced into calling them playful, inquisitive, and elusive. There is some resemblance to ball lightning, although nocturnal lights are much less energetic and are not associated with electrical storms.

Although our decadal collection begins with some classical nocturnal lights, there are three other well-defined categories of lights seen in the darkness that are "non-classical" plus a miscellaneous section in which the phenomena are hard to pigeon-hole.

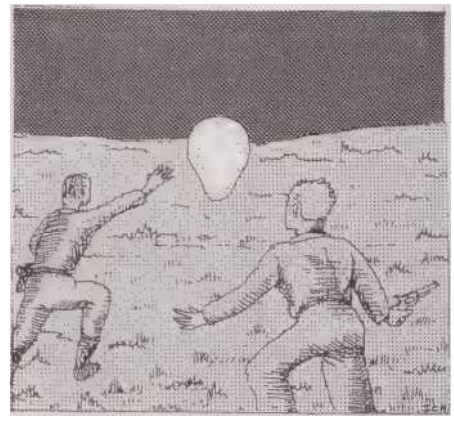
- Classical nocturnal lights. The Hessdalen Phenomenon, the Min Min Light, etc.
- Water-born nocturnal lights. The Nekha lights on the Mekong River.
- Foo fighters. The widespread. luminous phenomena reported by World War II pilots of all combatants.
- Beach sparks. Not electrical sparks but bright bioluminescent dis- plays induced by beach-walkers.
- Miscellaneous nocturnal lights. Infrared nocturnal lights, luminous fog-like structures.

CLASSICAL NOCTURNAL LIGHTS

AN UNKNOWN ATMOSPI1ERIC LIGHT PHENOMENON

Between 1981 and 1985, hundreds of strange lights have appeared in a small valley in central Norway. Named after the valley, the lights have been named: The Hessdalen Phenomenon. A research station was set up in the valley in 1983. During January-February 1984, eight different kinds of Instruments were in use, with the following resulte:

- Camera with grating: Three pictures showed a continuous specti'uin. No spectrál Unes were seen on any picture.
- IR-viewer: This instrument was used too little to drawn any conclusión.
- Spectrumranalyzer: Sometimos there were electromagnetic signáis with harmonios of about 80 MHz.
- Seismograph: No local seismographic activity was measured.
- Magnetograph: The magnetic ñeld did sometimes change when the lights showed up. There also seemed to be a correlation with the magnetic pulsation.



Artist's rendition of soldiers pursuing a pear-shaped nocturnal light near the Parana River in South America over a century ago. (Journal of Science. 19: 447, 1882)

- Radar: The lights could be seen on radar. The speed varied all the way from 0 to 30,000 km/hour. Sometimes the radar saw something moving at a low speed, but no lights were seen by eye. Clearly, there was something there, but only the radar showed it.
- Láser: A laser-beam was directed toward the Ught, and the behavior of the light changed.

«Geiger-eounter: No radioactive radi- ation was detected. But the source was 1 km away when this instrument was used.

(Strand, Erling; "Project Hessdalen— A Field Investigation of an Unknown Atmospheric Light Phenomenon," Journal of Seientific Bxploration, 8:581, 1994)

LONG-LIVED BUBBLE IN THE ATMOSPHERE

August 4, 1984. Winchester, England.

H. Curtís gives us a fírst-hand account of another one of those strange bubble- like phenomena usually associated with eleetrical atmospheric disturbances.

In August 1984 I had just left Work at 5.30 p.m. and Was walking along an unfrequented side Street as a short cut to get to my bus. The weather was cloudy and sultry,- but there had been no reports of thunder in the area that day. I carne to a junction in the pavement which led only to car-parking for buildings lying farther back when a bubble about the size of a tennis ball sailed out of this side-way, in a straight Une, about the level with my shoul- ders, at a distance of some five or six feet. I stared at ií'in amazement, for where could a bubble have come from at such a place and time?

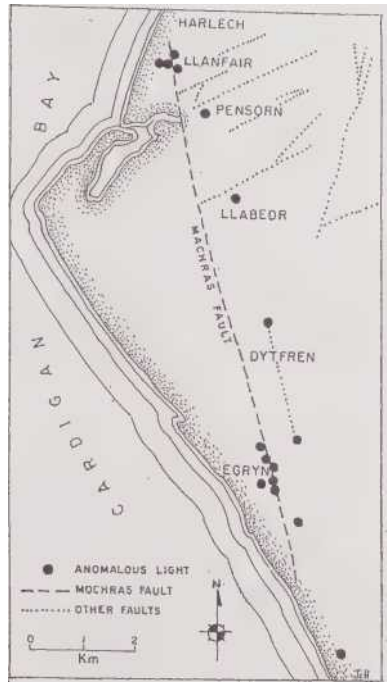
I was further amazed that it did not disintegrate... While gazing at the bubble it seemed to me that there was a dark band round it, which I inter- preted as being a refleetion of the tarmac road, although subsequently when experimenting with childrens' bubble mixture I discovered that . bubbles never reflect anything so discernible.

The bubble proceeded at its original speed, curving around me, and drifting down the centre of the road in the direction from which I had come. It then curved further round and descended towards a grass verge (which I had just passed). Here, I expected it to burst, but when it was about to land it ascended again and proceeded upwards, drifting, as it were, with various air cúrrente, up over a six-foot wall on the other side of the road to the height, ap- proximately, of the buildings. It then drifted out of sight into what is a publie park. I could not believe how it could remain intact for so long.

The percipient was interviewed, and further facts suggested that this may have been a form of ball lightning.

(Curtís, Mira; "Long-Lived Bubble in the Atmosphere, August 1984," Journal of Meteorology, U.K., 20:214, 1995)

Comment. In our catalog Remarkable Luminous Phenomena we have eollected 13 other cases of similar bubble-like phenomena. The most famous of these occurred on August 17, 1876, at Ring- stead Bay, England, when numerous luminous bubbles floated amidst obser- vers.



During the 1904-1905 Welsh religious revival, anomalous lights (the Egryn Lights) were seen along the Mochras fault that passes cióse to the Egryn Chapel.

BAILEY'S PRAIRIE LIGHT

Usually we rely upon the current science literature for these digests appearing in Science Frontiers. But on rare occasions, someone will send in a personal observa- tion that must be added to the files.

The file-of-the-moment is GLN1 or Low-Level Nocturnal Lights. The well- known María and Brown Mountain lights are in this category, but they are usually seen at a distance and can easily be written off as the headlights of far- off automobiles. Some GLN1 lights, how- ever, involve cióse encounters. The Tri- State or Hornet Light is an example of this variety. So is Bailey's Prairie Light.

We have at hand a lengthy, detailed deseription of an encounter with this particular light from J.H. Hall, Jr.; and it contains some fascinating features,

Located a few miles west of Angleton, Texas, south of Houston, Bailey's Prairie Light was a well-known, permanent fea- ture of the area 32 years ago when Hall and his family hunted it down on their way home from a day at a Texas beach.

In most respecte it is a typical "spook-light," but its remarkable interactions with Hall's inquisitive family spark the interest of the anomalist.

As described by Hall, Bailey's Prairie Light was a fairly bright, yellow spheroid varying between a soccer ball and basket-ball in size. Its surface brightness was low, most of the light originating from slowly moving internal filaments. Its height varied between 3 and 5 feet above the ground. It was not intelligent or inquisitive, as some spooklights are claimed to be. In fact, it would not
tolérate cióse human approaeh---anything closer than about 4 feet caused it to move to a new, more distant position. ' Hall's children deemed the light a "fun thing."

Mark "ran through" the light several times and it went out and "popped up" around 30 to 100 feet away, al- ways in the same direction.

Then Dawn "ran through" it from another direction. Same result.

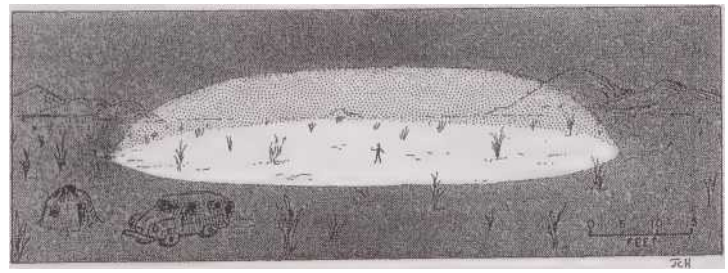
The light was coid, no sensation of heat was felt when the children ran through it. However, each "run through" and subsequent position change dimmed it. If not harassed, the light returned to what seemed to be its optimum location. Hall opined that this position was pro- bably the focus of energy of some sort.

After playing with Bailey's Prairie Light for an hour or so, Hall's children became bored, and the family resumed their trip home, stopping for a Dairy Queen on the way.

(HaU, John H., Jr.; personal communi- cation, March 19, 2002)

IS THE MIN MIN LIGHT A FATA MORGANA (MIRAGE)?

If one looks hard enough, one will find mentions of the María Lights and the Brown Mountain Lights in the science literature. Perhaps the Min Min Light has been ignored because it patrols the far- away Channel Country of Western Queens- land, Australia. Happily, we now have a substantial study of the Min Min Light in a respected journal. The author, J.D. Pettigrew, University of Queensland, draws upon his five personal contacts with the Light and M. Kozicka's popular



Mexico's Kino Light is reputed to be a stationary blue glow that one can walk into with impunity. This is an artist's concept based upon several informal re- ports. (Fate, 23:63, June 1970.)

book The Mystery of the Min Min Light.

Pettigrew writes:

> Viewed through binoculars, the light is often seen to be a fuzzy, roughly circular disc, a fraetion of a degree of are in diameter (that is, usually seen to be smaller than the diameter of a full moon, which is 0.52 degrees of are), rather than a point source of light like a star. The fuzzy edges are usually in rapid motion, like a swarm of bees. While there are rare reports of Min Min lights overhead for short times, especially when the terrain has hollows, the majority of accounts de- scribe the light as if it were floating not far above the horizon.

It is evident from the fíve detailed cases provided by Pettigrew that the Min Min Light has a "mind of its own," some- times (apparently) approaching the ob- server and sometimes (apparently) fleeing pursuers—even at 120 kilometers/hour! Shooting at it with a rifle will scare it away, though. All in all, the Min Min Light differs little from many other "nocturnal" or "ghost" lights.

Pettigrew's analysis and conclusión about the Min Min Light's possible naturé is properly objective and well within the bounds of scientific thinking.

> Many of the strange properties of the Min Min light are explicable in terms of the unusual optical conditions of the Fata Morgana, if account is also taken of the human factors that opérate under these highly-reduced stimulus conditions involving a single isolated light source without reference land- marks.

(Pettigrew, John D.; "The Min Min Light and the Fata Morgana," Clinical and Experimental Optometry, 86:109, 2003. Cr. P. Huyghe)

WATER-BORN NOCTURNAL LIGHTS

MEKONG MYSTERY

The following question was posed in the September 6 issue of New Scientist.

> My wife and I saw a puzzling sight in October 1994, in the Mekong River near Nongkhai, Thailand, during a full moon, in the evening. Lights ap- peared under the water for a few hundred metres along the Mekong River. They rose from the bottom of the river and floated to the surface, then shot like missiles into the sky and out of sight. They were the size of beach baila, and many flew out of the water every few minutes, sur- facing about 10 metres apart. 1 am told that this happens every year at the same time. Locáis say it is caused by a serpent releasing her eggs.
> Does anyone know of this phenomenon?

A. Pentecost answered. He noted first the similarity of the Mekong phenomenon to the will-o'-the-wisp or ignis fatuus. The usual explanation of ignis fatuus blames the spontaneous combustión of marsh gas. However, the Mekong lights are initially seen under the water where there would not be enough oxygen to support combustión. Pentecost sug- gested instead phosphorescent bacteria or the "coid fíame" of phosphorus vapor which might form through diphosphane decomposition.

(Pentecost, Alian, et al; "Mekong Mystery," New Scientist, p. 96, September 6, 1997)

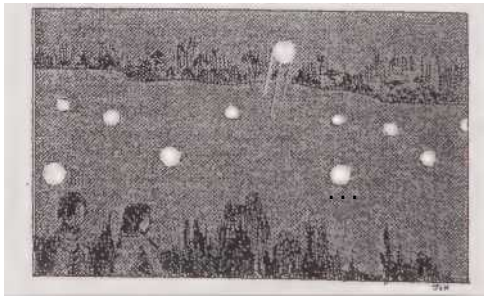
References. The Mekong phenomenon may be allied with the many examples of luminous aerial bubbles. See our Remark- able Luminous Phenomenaa for good eol- lection of them. Also the next Ítem.

MORE ON THE MEKONG MYSTERY

Those basketball-sized lights erupting from the Mekong River, Thailand, (above) turn out to be a well-known annual event. Their offi'cial ñame is: the Nekha Lights. They have even been filmed and shown on Thai TV. These weird luminous displays occur during the October full moon and last only about 30 minutes. The lights rise out of the river and nearby rice paddies, but only along a small stretch of the river straddling the Thailand-Laos border.

(Anonymous; "Mekong Mystery," New Scientist, p. 109, December 20/27, 1997)

Comment. Some marine species, such as the paolo worms, rise to the surface annually to spawn under a full moon. Could the Mekong Lights have a biologi- cal origin?



Artist's concept of the annual rising of the Naga (Nekha) fireballs along the Mekong River, Thailand.

THE NAGA FIREBALLS

Twice in the text above, we have touehed on the Naga Fireballs that rise from Thailand's Mekong River when the moon is fuU on the eleventh lunar month (in October). During this annual event, hundreds, sometimes thousands, of red, pink, and orange luminous spheres bréale the river's surface and sail off into the sky. This event has been observed for hundreds of years and, in moderp times, repeatedly video-taped. It is now a major tourist attraction.

The year 2002 display was disappoint- ing; only 829 firebaUs counted at the usual locations. And they seem to be getting smaUer, too. In 1994, some were the size of beachbaUs, in 2002 the size reference is the tennis hall.

Scientific studies of the phenomenon seem nonexistent. We are left only with some very wild surmises: (1) Spontaneous ignition of riverbed gas deposite released by the full-moon's gravitational puU (!); and (2) The combustión of natural butane and atomic oxygen created by the full-moon's ultraviolet radiation!

Obviously, we need some hard science applied here. And what's so different about the October full moon gravitation- wise and ultraviolet-wise?

(Sutton, David; "The Naga Fireballs," Fortean Times, no. 166, p. 35, February 2003. Anonymous; The Gate, p. 10, Janu- ary 2003. Both of these off-mainstream publications cite Thai newspapers.)

Comment. There are more-solid references. See GLN1-X73 in our Remarkable Luminous Phenomena.

Also: Naga lights = Nekha lights.

GHOSTLY FLAMES RISE FROM PENRHYN LAGOON

Penrhyn Island is the northernmost of the Cook Islands in Polynesia. In the mid-1960s, M. Shadbolt was aboard the Akatere exploring and photographing the idyllic Cook Islands for National Geo- graphic. One day, soon after the Akatere had tied up at Penrhyn, Shadbolt learned that he has just missed a most curious luminous phenomenon. His report follows:

> The night before, the inexplicable "ghost fire" of Penrhyn had been seen burning in the middle of the 108-square-mile lagoon. Fluttering unpredictably, several times a year, the fire is firmly believed to herald death---and that night a year-old sick child had died on the island.
>
> Archie Pickering told me that D.S. Navy men, during World War II, crashed a PT boat on a submerged reef while seeking the source of the fire. It remains unexplained.

(Shadbolt, Maurice; "Paradise in Search of a Future," National Geographic Maga- zine, 132:202, August 1967. Cr. R.E. Molnar)

Comment. Bioluminescence seems out of the question here, as do releases of methane hydrate. (The latter requires water near freezing for .stability.) There is some similarity to the wül-o'-the wisp, but marshes do not grow in tropical lagoons. We are also reminded of the Bay Chaleur fireship of Cañada and the Palatine Light off Montauk Point, New York.

FIERY EXHALATIONS IN WALES

1693-1694, Harlech, Wales. The older literature presents several accounts of the strange luminous and incendiary phenomena which we now attend to. The foHowing excerpt is from a 1790 gazet- teer, as reprinted in New Scientist.

A remarkable phenomenon was seen near this town [Harlech] in the year 1694 and it continued about the space of eight months. It was a livid vapour, or fiery exhalation which seemed to arise from the sea on the borders of C aernarvonshire. It made its first appearanee on the side of a bay, a little after sunset, and from thence spread itself in the most gradual manner, until it had set all the houses in the neighbourhood on fire.

Not only the ricks of hay, corn, and other forts of grain were de- stroyed, but also the vegetables in the gardens, for it had so noxious a smell that everything perished where it diffused its baleful infuence. Its effect were severely felt by the cattle to whom it communicated a contagious distemper, by which many of them died.

It made its appearance regularly every night, always rising at the same place, ñor did it stop its course either by rain or storms. It was some- times visible by day, but it was very remarkable that it never did any damage except in the night. The flames were in no way violent, but its continuance at last consumed everything that opposed it.

Those few scientists who have mused over this curious oíd account have con- cluded that the "fiery exhalations" re- sulted from the spontaneous ignition of marsh gas; that is, the-flames were wiíl o'-the-wisps, albeit relatively power- ful ones. Wiil-o'-the-wisp theory States that marsh gas (mostly methane) also contains phosphane and traces of diphos- phane (P_2H_4). The latter gas reacts spontaneously with air and ignites the methane, creating weak blue flames.

The New Scientist article mentioned a parallel modern occurrence that is new to us and worth recording here. In 1997, a dramatic series of spontaneous fires burst forth in the town of Moirans-en- Montagne located in the Jura mountains of Trance. No details were presented although emanations of natural gas were suspeeted.

(Pentecost, Alian; "From the Deep," New Scientist, p. 89, August 26, 2000)

Comments. We classify will-o'-the-wisps along with other nocturnal lights in GLN1 in Remarkable Luminous Phenomena, where one can find doubts about the standard explanation of these phenomena that were presented above.

The región of Wales that experienced the fiery exhalations in 1693-1694 also saw another "flap" of less-destructive luminous phenomena in 1904-1905. These were the Egryn Lights, which were con- centrated along the active Mochras Fault and might, therefore, have been earth- quake lights, which have been officially . named but not authoritatively explained.

Even more Ínteresting (to us) than the possible earthquake lights is the association of the Egryn Lights with the great Welsh religious revival of 19041905. A great variety of luminous phenomena were observed by many of the worshippers caught up in the fervor.
In particular, the lights seemed to attend the preaehings of a Mary Jones, who often held forth at the Egryn Chapel that gave the lights their ñame.

FOO FIGHTERS

1945: "FOO FIGHTERS" SPOOK ALLIED AIRMEN OVER GERMANY

A few readers may be oíd enough to remember the consternation of bomber crews over Germany as they were dogged by balls of light called "foo fighters." (vol. 1, p. 250) For these oldsters, the following newspaper account from the period will bring back memories, but no explanation of this enduring mystery.

The descriptions of the new Germán "foo-fighters," or balls of fire, con- tained in dispatches from the western front, fit into several well-known electrical phenomena. ‘

Two of these are induction and ball lightning, which have some of the aspects of another electrical phenomenon, St. Elmo's fire. If the foo-fighters are electrical, they are something created in the air cióse to the Allied planes, rather than any- thing shot like artillery shells or any- thing floating in the air in wait for planes.

Induction is suggested by the reporta from Allied airmen, that the foo-fighters keep up with their planes at fixed distahces, regardless of plañe speed, changes in speed or changes in direction.

Electrical induction of some sort would explain such marvelous synchronization. Nothing else that is well known would explain such perfect timing___Induction, however, fails eompletely to describe what happens when a fire-ball zooms upward, leaving its plañe. Apparently the balls fly paths thousands of feet away from the planes.

(Blakeslee, Howard W.; "Nazi Fire Balls May Be Kind of Ball Lightning," New York Herald Tribune, January 3, 1945)

FOO FIGHTERS RECALLED

U.S. airmen called them "foo fighters." These still-unexplained luminous phenomena seem to have been filed away and forgotten by Science. It is not that good evidence is lacking. Perhaps the foo fighters cannot be encompassed by recognized laws of physics! We last re- ported on them in 1992 (vol. 1, p. 250), when some oíd Air Forcé records turned up. We now re-resurrect the foo fighters with an Associated Press Bulletin from 1945.

AMERICAN NIGHT FIGHTER BASE. France, Jan. 1.—The Germans have thrown something new into the night skies over Germany—the weird, mysterious "foo-fighter," balls of fire that race alongside the wings of American Beaufighters flying intruder mis- sions over the Reich.

American pilots have been encountering the eerie "foo-fighter" for more than a month in their night flights. No one apparently knows what this sky weapon is.

The balls of fire appear suddenly and accompany the planes for miles. They appear to be radio-controlled from the ground and keep up with planes flying 300 miles an hour, offi- cial intelligence reports reveal.

"There are three kinds of these lights we cali 'foo-fighters,'"
Lieut. Donald Meiers of Chicago said. "One is red balls of fire which appear off our wing tips and fly along with us; the second is a vertical row of three balls of fire which fly in front of us; and the tliird is a group of about fifteen lights which appear off in the distance—like a Christmas tree up in the air—and flicker on and off."

"A 'foo-fighter' picked me up recently at 700 feet and chased me twenty miles down the Rhine Valley," Lieutenant Meiers said. "I turned to starboard and two balls of fire turned with me. I turned to the port side and they turned with me. We were going 260 miles an hour and the balls were keeping right up with us.

(Anonymous; "Balls of Fire Stalk U.S. Fighters in Night Assaults over Germany," New York Times, January 2, 1945. Cr. M. Piechota.)

B-24 SIGHTS "CIRCLES OF LIGHT"

The still-unexplained balls of light ("foo fighters") seen by Allied pilots over wartime Germany were duplicated in the Pacific. In addition, strange "circles of light" followed American aircraft.

The following paragraphs were taken from the "Weekly Intelligence Summary," Headquarters, Eastern Air Command, South East Asia. June 1, 1945.

A B-24 of the llth Bomb Group on a snooper mission over Truk during the early morning hours of 3 May 1945, encountered what may prove to be as baffling a phenomena (sic) as the balls of light seen by the B-29s while over the Japanese mainland. (Excerp- ted From Hq. AAF, POA, Air Intell. Memo No. 4, 8 May 1945.)

The B-24 first observed two red circles of light approaching the plañe from below while still over the Truk atoll. One light was on the right and the other was seen on the left of the B-24. The light on the left side turned back after one and one half hours. The one on the right remained with the bomber until the B-24 was only 10 miles from Guam. From the time that the B-24 left the atoll, the light never left its position on the right side. It was reported by the crew members as sometimes ahead, sometimes behind, and sometimes longside the B-24 and always about 1200 to 1500 yds distant.

The light followed the B-24 in dives from 11,000 to 3,000 feet, through sharp course changes and even brief cloud cover always keeping its same relative position and distance. At one time, the pilot turned into the light and he definitely reports no closure occurring. During the night high cirrus clouds masked the moonlight and no part of the object was observed except the light. At daybreak, the light changed to a

steady white glow and a possible wing shape with a silver glow was noted by some members of the crew.

(Anonymous; "B-24 Sights 'Circles of Light'," U.F.O Historie al Review, p. 8, no. 2, September 1998. Cr. B. Green- wood)

BEACH SPARKS

BRIGHT SPARKS ERDPT FROM BEACH

Here foliows a letter from S. Román, Melbourne, Australia:

The tide was out one day as a friend and I were walking along a beach.
As we walked on the littoral zone— the part of the beach between low and high tides—strange blue lights _ lit up around our feet as we stepped on the sand. The lights were similar to lightning and the harder we stepped on the ground the more intense the blue lights became. Nobody has been able to provide us with a satis- factory explanation and, no, we were not under the influence of any drugs. Just what was happening?

(Román, Suzanne; "Bright Sparks," New Scientist, inside back cover, Janu- ary 13, 1996)

Comment. See the next Ítem for the most likely explanation of bluish "beach sparks." These sparks are obviously not the usual type of nocturnal light!

MORE SPARKS ON THE BEACH

Sharp eyes often pick out unusual phe- nomena in very usual places. From Cali- fornia, A. Hastings writes:

I also had an experience with "Sparks on the Beach" (see above). This was on the Pacific Ocean Beach at San Gregorio, south of San Francisco, severa! years ago. I was walking on fairly wet sand, just above the tide line. As I stepped, the sand around ray feet lit up with small bright dots of phosphorescence. I would not have said that the color was blue, but it could have been like blue- white, like the star Rigel. I found that if I stepped hard or stamp- ed my foot, the lights flashed brigh- ter and the lit area went out farther from my foot. I could see the move- ment expanding out. After a stamp or two, they did not light up as much.
I assumed that thís was caused by some organism that lit up when it felt pressure, and "wore out" after ít had done this a few times—a re- fractory period probably occurred.

(Hastings, Arthur; personal communica- tion, Mareh 21, 1996)

From E. Widder, at the Harbor Branch Oceanographic Institution in Florida, we have a good explanation the these beach "sparks."

Flashing blue lights, such as those deseribed, are bioluminescence, which is visible light made by living organ- isms.

Light sources in the sand are probably bioluminescent dinoflagellates or possibly bioluminescent ostraeods.

Bioluminescent ostraeods, sometimes called sea fireflies, are tiny crus- taceans about the size of tomato seeds, which release a cloud of bioluminescence to attract mates as well as for defence. Ostraeods retain their bioluminescent Chemicals when dead and light can be activated by a mechani- cal mixing of the Chemicals.

(Widder, Edith; "Bright Sparks," New Scientist, p. 89, June 15, 1996)

Comment. The "mechanical mixing" men- tioned by Widder could come from the pressure of one's footsteps.

MISCELLANEOUS NOCTURNAL LIGHTS

DRIFTING, GLOWING FOG

January 29, 2001. Avening, Gloucester- *l

shire, England. Testimony of M.J. "Mc- Laughlin as reported by C. Roland.

On Monday, January 29, I took a ride out Stroud way and decided to walk around Woodchester Park. It was a nice day and what better place to take advantage of the weather. I had not been [there] for a couple of years.
Everything was going as normal until I got down into the park. I took the "red" pnth which takes you right round the lakes. I had walked down to the oíd kennels when I saw what I can only describe as a glowing fog.

I thought it must be some sort of peculiar weather phenomenon. I car- ried on skirting the lake but the "glow" was still there. 1 looked around for someone to confirm this odd scene with me but 1 was alone. 1 must admit I began to feel a little unnerved by it. 1 quickened back; the glow could still be seen except it had drifted out over the lake. It was about six feet (two metres) high and three feet (one metre) wide— although not a column. Indeed, at one point I almost thought it looked like a figure.
I have never seen such a peculiar sight in all my days, and only wish someone else had seen it, too.

(Roland, Cynthia; "Peculiar Sight in Park," Journal of Meteorology, U.K., 26:229, 2001.)

Comment. It is the luminous feature of this phenomenon that makes it so inte- resting. Could it have been a wiH- o'- the-wisp? Or it might have been kin to the drifting, luminous "bubble" de- scribed on ;p. 227.

STRANGE PHENOMENON DETECTED BY RADARS AND SATELLITES

January 12, 1994. Near Monte Vista, Colorado.
'

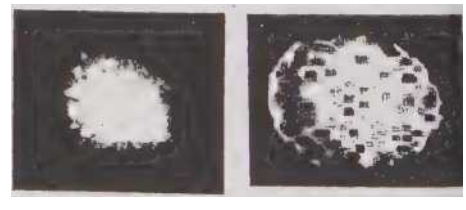
At 2:55 PM local time, radars of the North American Aerospace Defense Com- mand and satellite-borne instrumenta detected an unexplained "heat-radiating" phenomenon, Some sort of fire or explosión was suspected, but air and ground searches by local authorities turned up nothing.
Possibly relevant: On the night of January 15, a Rio Grande County sher- iff's deputy on patrol saw three heli- copters, two with large strobe lights, apparently searching the suspect area. Military officials denied having any craft in the area.

(Anonymous; "Officials Baffled by Spec- tacle on Radar," New Mexiean, January 27, 1994. Associated Press Ítem. Cr. P. Viemeister)

Comment: Infrared sensors on satellites could detect "heat-radiating" phenomena, but it is unclear what ground-based radars "sawv" If some kind of military operatioii were involved, it is doubtful that radar and satellite observations would be made publie. Caution advised here!

IMAGES OF DIVERSE PHENOMENA? OR ARE THEY OF THE SAME ENTITY?

In our literature surveys we could not help noticing that the magnified photo- graphs of supposedly different luminous phenomena sometimes look very much alike, as in the two accompanying photos. Magnified images of the famous Hess- dalen lights of Norway also display the same knobby exterior. It should also be mentioned that some reports of ball lightning claim a "wormy" exterior.
Of course, photographic artifaets may create the similarity of the two examples illustrated. Or, generalizing further, several supposedly different luminous phenomena may have a common type of energy source.



(Left) Enlargement of a nocturnal light floating near the Toppenish Ridge, Wash- ington state. (D.W. Akers and J.S. Derr) (Right) Enlargement of one of the famous Lubbock Lights from that classical UFO event. (D.R. Burleson)

UNIDENTIFIED LIGHT

January 14, 1993, Eastern North Pacific. Aboard the m.v. B.P. Adventure, Panana to Chiba.

At 0235 DTC the phenomenon shown in the sketch was first seen about 15° above the horizon, bearing 265°. It was initially thought to be a down- ward pointing spotlight from an air- craft: it was bright (nearly white), cortical in shape and about I° high. During further observation the shape slowly enlarged, becoming more bell- shaped with a darker elliptical patch at the bottom. As it increased in size, the shape faded away and moved slowly towards the horizon in a slight- ly southerly direction before disap- pearing just above the horizon at 0254, bearing 260°.

The máximum height reached by the shape was about 5 ° and through- out the observation stars could be seen through it while at one point it was nearly obscured by cloud of which there was 1 okta. The only other bright object nearby was Venus, being slightly higher and to the south, bearing 248°, elevation aboüt 20°. Visibility was excellent as about 10 minutes after the observation a ship was spotted bearing 280° at a dis- tance of 16 n.mile. The observers felt that the shape was too regular to be a cloud and had no real idea of its origins.

(Peacock, K.E.; "Unidentified Light," Marine Observer, 64:17, 1994)

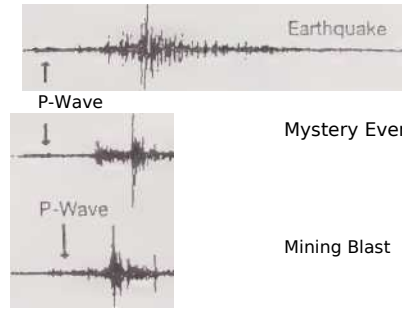
or perhaps the i-.pact of an iron mete- orite of, say, 6 feet in diameter. The visual reports coinciding with the seis- mic data describe a slow-moving object with no tail. No sonic booms were heard. There was, however, a major explosión accompanied by an enormous flash of light and a rising fireball. (Hardly legitímate earthquake phenomena!) If the "quake" was really due to a meteorite impact, there should be a cráter about 300 feet in diameter somewhere in Western Australia. None has been found to date.

Some suppose it was really a missile carrying a 1 kiloton nuclear warhead! (A test by some renegade group!) Un- fortunately for this theory, the seismic record is not at all like that typical of nuclear explosions.

The Australian mystery "quake" re- mabas just that. No single hypothesis accounts for all of the observations.

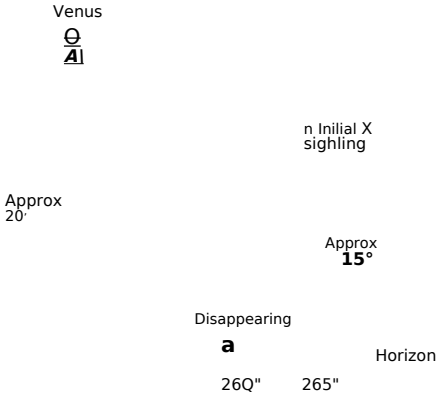
(Anonymous; "Australia'a Enigmatic Tre- mor," Science News, 151:359, 1997)

Comment. Compare the strange fireball and impact observed in Central America- in 1996, as described on p, 175 _



Comparison of seismogram types with that from the 1993 Australian "mystery event," which had a luminous component.

MISCELLANEOUS LUMINOSITIES



REVISITING A 1993 AUSTRALIAN "EARTHQUAKE"

First of all, the goldfields of Western Australia are not earthquake country. None have been recorded there since records began in 1900. The supposed quake of 1993 was essentially an unpre- cedented event. Secondly, the 1993 "happening" was accompanied by a whis- tling fireball that was seen by several motorista and truck drivers. Thirdly, the underground damage wrought in the gold mines was more like that due to blast compression than an earthquake.

The event under consideration occur- red May 28, 1993. It registered 3.7 on the Richter Scale. The epicenter was somewhere in the Leonora-Laverton area northwest of Perth. Officially, it was an earthquake. Indeed, the seismic record resembles that of either_ ah earthquake

EARTHQUAKE LIGHTS

LUMINOUS PRECURSORS OF THE 1995 KOBE EARTHQUAKE

•Some residents of Kobe and nearby cities saw aurora-like phenomena in the sky just before and after the quake.

•A Kobe fireñghter observed a bluish- orange light above a shaking road that lasted about 4 seconds.

•A hotel employee on his way to work on Rokko mountain: "saw a flash run- ning from east to west about two to three meters above the ground shortly after. the quake. The orange flash was framed in white."

•Flashes of light were widely observed.

(Shimbun, Yomiuri; "'Aurora' Flashes Observed before, after, Quake," The Daily Yomiuri, February 9, 1995. Cr. N. Masuya.)

THE SAGUENAY EARTHQUAKE LIGHTS

November 1988-January 1989. Saguenay región of Quebec. [1]

During this period, a total of 67 quakes were recorded. The foreshock (November 23) registered 4.8; the main shock (November 25), 6.5 m_{nl}g. Many after- shocks followed. During this spate of tremors, 38 unusual luminosities were initially reported from the región, 8 of them before the foreshock, being in ef- fect earthquake precursors. Afterwards, residents were queried for details and additional observations. A total of 46 reports sufficiently detailed for analysis were obtained.

These luminous phenomena were clas- sified according to a scheme proposed by F. Montandon in 1948. Montandon's five categories aré:

(1) Seismic lightning (no thunder);

(2) Luminous bands in atmosphere;

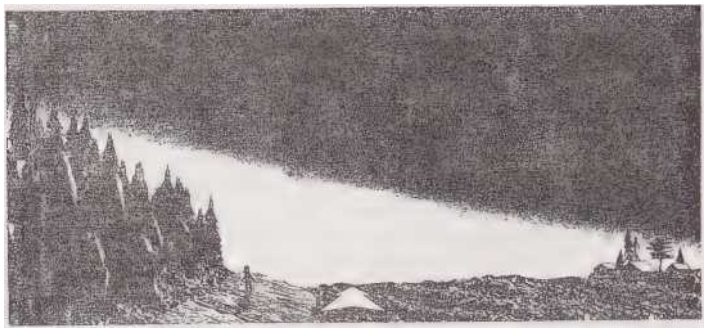
(3) . Globular incandescent masses;

(4) Fire tongues, small mobile flames near the ground, like will- o'-the wisps; and

(5) Flames emerging from the ground.

The globular incandescent masses were by far the most common type of earthquake light during this Canadian "flap." Of theBe, F. St-Laurent w rites:-

There were twenty-two reports coming from different places. Often they were seen far from the epicenter or when the seismic activity was low or quiet. Some were stationary (in one



Artist's sketch based upon reports of ■witnesses of a fast-moving, bluish-white light seen at the begin- rxing of the main shock in the Saguenay area on Novem- ber 25, 1988.

case, the yellow and orange mass presented a horizontal elongated form), others were seen emerging from the ground, some were very fast-moving^ - near the ground, one was seen attached to a luminous band—all as described by Montandon.

(St-Laurent, F.; "The Saguenay, Quebec, Earthquake Lights of November 1988-January 1989," Seismological Research Letters, 71:160, 2000. Cr. *3.* Derr.)

CORPOSANTS OR ST. ELMO'S FIRE

AN ÜNUSUAL MANIFESTATION OF ST. ELMO'S FIRE

February 18, 1877. North Atlantic Ocean, a violent storm was in progresa.

... during the height of the storm there appeared on the trucks, yards, and stays large balls of fíre of a phosphorescent nature, strung at intervals of one or two feet and giving the ship the appearance of being decorated with Chínese lanterns, only the lights were far more brilliant. They settled on the vessel like a shower of meteors, and disappeared almost as suddenly as they appeared — an occasional one dropping from the yards and bursting with a loud report. One of them fell and burst almost in the face of the chief officer, but beyond dazzling him for a moment, it caused him no inconvenience.

(Anonymous; "Electrical Phenomenon at Sea," Scientific American Supplement, 3:1069, 1877)

Comment. Mobile forms of St. Elmo's fire are rare; even more rare are those that explode.

PIRES PEAK PHENOMENON

When we cataloged mountain-top glows from around the world in Remarkable Luminous Phenomena, we had speciñc references for the Andes, the Swiss Alps, and even Mt. Adams, in New Hampshire; but we had nothing for the Rocky Mountains. Something has finally been unearthed in a 1929 issue of the New York Times.

Pikes Peak, Colorado

Static electricity, which charges the atmosphere of the'higher mountain peaks when storms are brewing, has appeared on Pikes Peak in the mani- festation of ghostly fiares about the summit at night.

So brilliant have the lights become that airplanes were sent to observe the slopes and summit to see if the fiares could have been caused by stranded hikers.

(Anonymous; "Static Electricity Fiares on Pikes Peak," New York Times, February 24, 1929. Cr. M. Piechota)

Comment. Powerful electrical storms stimulate some of the mountain-top glows, but so do earthquakes. The famed Andes Lights have been reported to be "especially magnificent" during earthquakes.

A display of St. Elmo's Fire on top of Pike's Peak, Colorado, in 1882. Sometimes, the sharp peaks themselves fiare

ÜNUSDAL CORPOSANTS

May 8, 1998. North Atlantic Ocean. Aboard the m.v. Flinders out of Phila- delphia bound for Pennington.

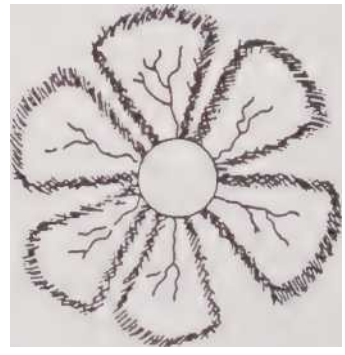
The vessel had just passed through a weather front that produced frequent, violent sheet lightning. Green St. Elmo's fire was glowing on the aerials.

At about 2310 it was also noted that the lever extending about 18 cm over the ship's starboard bridge wing to position a deck light was also radiating light. This light was a palé violet glow extending in 'spokes' of 10 cm in length from the round end of the lever which was about 3 cm in diameter.

There were six individual and uniform spokes shot through with brighter purple and white bolts resembling lightning. Over the noise of the wind a sharp crackling and hissing sound could be heard coming from the phenomenon.

The seaman was called to have a look at the light, he attempted to touch it but the light receded as his finger approached within 3 cm of it. The effect died away at about 2340 as soon as rain started to fall.

(Smedley, R.; "Corposants," Marine Ob- server, 69:55, 1999)



Comments. The corposant's six-fold sym- metry is like that of snowflakes. Strange as it may sound, they may be a connec- tion. First, recall what J. Maddox once wrote about snowflakes in Nature.

But the symmetry of the whole crystal, represented by the exquisite six-fold symmetry of the standard snowflake, must be the consequence of some co- operative phenomenon involving the growing crystal as a whole. What can that be? What can tell one growing face of a crystal (in three dimensions this time) what the shape of the op- posite face is like? (vol. 1, p. 319)

_ The speculation is that electrical forces may control the long-range symmetry of snowflakes as well as the unusual six-fold symmetry of the corposant described above. It's a thought anyway.

The word "corposant" is said to be derived from the Latin for "bodies of the saintB." It seems that the corpses of some of the saints have been luminous! (See BHA22 in Humane I.)

CONTAGIOUS ST. ELMO'S FIRE

February 8, 1999. North Sea. Aboard the m.v. Repulse Bay. enroute Rotterdam to Hamburg.

Whilst the vessel was in the Germán Bight, in position 53°57' N. 07°08' E, a classic example of St. Elmo's ñre was observed at 0230 TJTC. A high- pitched buzzing sound was heard on the córner of the bridge wing, and what seemed to be a glow was also present. Observers were able to pick up the static and saw short flame- like 'tufts' of blue and violet appear on the ends of their finger-tips, as if the fingere had ignited.

The 'flames' were able to be passed from per son to person, and were even placed upon another observer's fore- head!

There were no electrical storms in the area but there was a mixture of hail and snow falling at the time. Two of the observers experienced strong electrical shocks from each other, and also electric shocks each time snow landed on their skin-—a very peculiar experience!

(Byrne, K.; "St. Elmo's Fire," Marine Observer. 70:6, 2000)

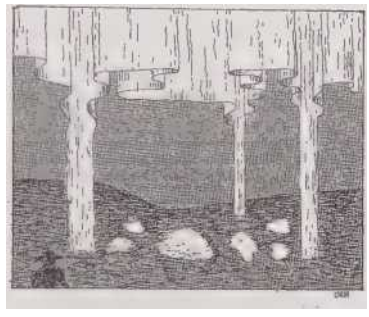
AURORA-LIKE PHENOMENA

AURORAR STREAMERS DESCEÑO TO THE EARTH'S SURFACE

Scientists stoutly maintain that auroral displays cannot deseend below altitudes of about 80 kilometers and certainly never down to the earth's surface.
All observations of auroratstreamers reaching the ground must, therefore, be illusory. Nevertheless, some accounts of low-level auroras are very convincing.

Summer 1918. Smiley, Saskatchewan. Altitude 2300 feet. A warm, calm sum- ner night.

On leaving the house at about one a.m., I was surprised to see that the aurora was surrounding me in all directions, as far as I could see, (nearly half a mile). Some streamers extending from the curtains reached to the ground, and others nearly so. Several, a dozen or more, were in contaet with the ground within a rad- ius of a hundred yards from me. Overhead the sky appeared to be full of clouds of luminous material, with a frequent ascending and. descending movement. Whilst watching this general effect, I saw a streamer drop from the curtain and make contact with the ground less than 50 yards from where I stood, dropping at a speed comparable with that of falling water, and the angle from me to where it left the curtain was about 25 degrees. There was no distribu- tion of material short of this point of contact with the ground, but to the leeward of the streamer, patches of luminous material formed and drif- ted in the air, and faded out in the course of a few seconds; this con- tinued for a distance of about 25 yards, and then a patch of luminosity formed cióse to the ground, and rose with a swift upshooting movement and joined the curtain above, forming a streamer similar to the one that descended. The patches then ceased to form, and both these streamers appeared as being in a state of waver- ing suspensión like unto the other streamers, as shown in the accompany- ing sketch.



An apparent low-level auroral display in Saskatchewan. Streamers seemed to deseend from the auroral curtain to the ground, while luminous, fog-like patches drifted along the surface.

A little later following the descent of a streamer direetly to my windward, a number of patches of luminosity drifted past me within a distance of a yard or two. Some were very near the ground, some level with my horizontal line of sight, and some con- siderably higher. These patches of luminosity consisted principally of tiny sparks or dots of light, that were interspersed with groups of needle-like darts of light, that appeared to be both ascending and descending at intense speed, the effect being very much like a "brush dis- charge.

The nearby patches of luminosity also emitted a "cricking" or "spittering" sound.

(Stumbles, H. Edward; "An Account of Auroral Phenomena Observed in Western Cañada," Royal Astronomical Society of Cañada, Journal, 32:451, 1938)

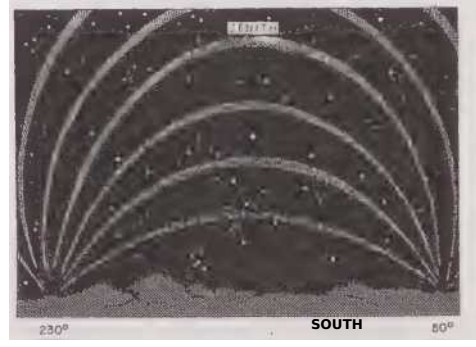
Comments ■ It certainly seems as though Stumbles was immersed in a weak dis- charge of electricity occurring between the earth and high ionosphere where the auroral curtains shone.

The pillar-like streamers in the sketch remind one of the searchlight- like beams of light séen radiating sky- ward from Andean peaks during electrical storms; i.e., those famous "Andes Lights." (See GLD1 in our catalog Remarkable Luminous Phenomena for "mountain-top glows.") '

A SKY-SPANNING AURORAL ARCH

August 28, 1916. Cañada.

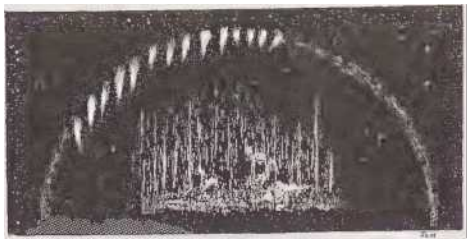
The usual Northern Lights were feeble, but at half past ten there grew in the sky an immense are or ribbon of light ----------practically a com plete semicircle—stretching from a point on the horizon practically due east nearly up to the zenith, but a little to the south of it, and passing down practically to the western point of the horizon. Throngs of people gathered to see it and according to their account the like was never seen before. It was a fairly uniform band of light of about the same width as the rainbow. Its definiteness was sur- prising, there Was very little fading away at the edges; it was as if a paint brush had been drawn across the sky...For about an hour it arched the sky and during that time it was noticeably fixed relative to the earth, for some of the stars as they got higher in the east crossed it from the northern or convex side to the other.



In 1933, six luminous auroral bands crossed the English skies in an east- west direction.

(Anonymous; "Great Auroral Displays," Royal Astronomical Society of Cañada, Journal, 10:469, 1916)

Comment. This sharp and precisely drawn are is so different from the sway- ing draperies, pulsing ares, and "merry dancers" that characterize the usual auroral displays. We have not seen any good explanation of this phenomenon. More examples may be found in GLA2 in our catalog Remarkable Luminous Phe- nomena.



In 1903, a sky-spanning auroral arch with pennants was seen off the coast of Maine. A more typical aurora occurred within the arch.

BLACK AURORAS

July 23/24, 1998. Gulf of St, Lawrence. Aboard the m.v. Appleby, Port Cartier to Immingham.

> **The aurora borealis was sighted at 0330 UTC. There was a band mea- suring 35° long in azlmuth, with deep- blue almost black vertical bands lying between the altitudes of 15° and 25°. The colour changed to brilliant blue at 0335, lasting for about 15 minutes before cloud began to obscure it.**

What were the "almost black" vertical bands embedded in the main band? Aurora expert R. Livesey replied as follows.

> **There is a phenomenon called the 'black aurora' which consists of email regions of very low luminosity embedded in brighter auroral light; the 'black' rays reported from the Appleby could have been a phenomenon of this type.**

(Wilson, J.L.; "Aurora Borealis," Marine Observer, 69:112, 1999)

Black auroras may actually be more than just the contrast effect suggested by Livesey. Low-light TV systems de- tect clockwise vorticity in the black bands, and the bands seem to be as- sociated with upward electrón beams. In other words, black auroras are apparently a distinct phenomeon in their own right and not just non- luminous parts of the visible aurora.

(Stenbaek-Nielsen, H.C., et al; "Why Do Auroras Look the Way They Do?" Eos, 80:193, 1999)

FLASH AURORAS

Flash auroras are ephemeral auroral dis- plays lasting only a few seconds. They occur when auroral and geomagnetic activity is subdued worldwide. Under such quiet conditions, scientists do not expect to see auroras of any kind. Yet, experienced aurora observers keep on reporting these transient events.

June 13/14, 1987, Winnipeg, Saskatche- wan. T. Lohvinenko saw a fragmentary active rayed are in a clear sky at 0644 UT. It lasted for only a few seconds.

February 13/14, 1991. Near Glasgow, Scotland. While facmg south, A. Simmons observed rays and a luminous patch at an altitude of 45°. The phenomenon lasted 2 minutes.

In both of the above instances, the geomagnetic field was quiet and auroral activity virtually zero worldwide.

> **It is unprofitable at this stage to speculate on the cause or causes of the mid-latitude flash aurora as it is known in the Aurora Section. More ' authenticated observations need to be built up before they can become sta- tistically meaningful. The geomagneto- sphere is a very dynamic and restless organism in which some instability may develop to cause what, in engi- neering parlance, might be referred to as a short circuit in the magneto- spheric dynamo.**

(Livesey, R.J.; "The Flash Aurora," British Astronomical Association, Journal, 107:36, 1997)

ANOMALOUS AURORAL FLASHES

July 11, September 24, October 12, 2003; International Space Station

During his 6-month tour on the Station, E. Lu studied intensively the earth's auroras glowing over both magnetic poles. On the three dates above,

> **Lu saw something markedly different: flashes as bright as the brightest stars, which lasted only a second and then blinked off again. in one instance, he called crewmate Yuri Malenchenko over to the window, and he saw the bursts, too.**

Lu testified that these three flashes were distinctly different from the ran- dom retinal flashes astronauts experience when heavy cosmic rays pass through their eyeballB. He also eliminated light - ning, meteor flashes, and artificial ob- jects.

(Reichhardt, Tony; "Space Station Light SHow Sparks Aurora Riddle," Nature, 425:888, 2003)

TRANSIENT SKY BRIGHTENING

July 27, 1981. Norman. Oklahoma. After a flash of lightning:

> **...the sky took on a continuous, un- flickering aquamarine glow. The sky was nearly as bright as it is on a cloudy afternoon (timé: 2316), much like a neón light behind frosted glass. There were no lightning flashes and absolutely no sound other than the falling rain. The glow extended uni- formly in all directions to the horizon (as visible in housing developments), and persisted for 45 s. After it ter- minated, a similar light, now colored a reddish-orange and emanating from the cloud followed immediately. This new light persisted for 10 s and went out.**

(McGinley, John; "Observation- of Steady Glow and Multicolored Flashes Associated with a Thunderstorm," American Meteoro- lógica! Society, Bulletin, 63:189, 1982)

Comment. We have recorded many such temporary, all-sky brightenings but have found no explanation in the litera- ture we have surveyed. Víith scientists now recognizing sprites, blue jets, and other phenomena occurring above active electrical storms, we hope someone will soon pay attention to this puzzle.

AURORAL MAPS!

Auroral ares are created by electrical eurrents flowing high in the ionosphere — usually higher than 100 kilometers according to current [!] thinking. Therefore, scientists do not really expect to see terrestrial topography re- flected in auroral geometry. Neverthe- less, T. Pulkkinen of the Finnish Metero- logical Institute reported to the May 1998 meeting of the American Geophysi- cal Union that coastlines somehow coax auroral ares to align with them. In some 200 hours of observation along the Nor- wegian coast, there were nine clear-cut cases where auroral ares lined up north- south directly above the coastline. These alignments lasted 5-10 minutes.

L. Frank (of icy-comet notoriety) confirmed this effect with observations from NASA's Polar satellite. Sometimes auroral ares aligned themselves parallel to the Greenland coast for hundreds of kilometers. Auroral ares that fanned out east-to-west seemed to hit a barrier when they reached the Greenland coastline; they seemed to be deflected by it, even though the coast was more than 100 kilometers beneath them.

(Hecht, Jeff; "Leading Lights," New Scientist, p. 16, May 30, 1998)

MARINE LIGHT DISPLAYS

Luminous ships' wakes, so common in tropical seas, are nonanomalous. But vast rotating, spoked, light wbeels and allied fantastic geometricai displays of marine bioluminescence are high on the list of puzzling natural anomalies. These light displays are usually encountered in the Persian Gulf, across the Indian Ocean, and into the South China Sea. Ridiculed as sailors[1] wild tales for centuries, modern vessels plying these waters have nevertheless reported hundreds of these enigmatic examples of organized marine bioluminescence. Today's ship crews tell of kilometer- wide Catherine wheels of light; sometimes more than one in counter- rotation. Expanding rings of luminescen.ce and bright spinning crescents are also observed, as are other weird apparitions. Curiously, science-in- general takes scant notice of these unexplained phenomena.

In our catalog Remarkable Luminous Phenomena, over a dozen distinct types of marine light displays are described. Over the 1994-2004 period, seven of these species have appeared. in Science Frontiers, taken pri- marily from the now-defunct Marine Obseryer. These are presented in the following order.

•Luminous bands. Single or groups of straight, parallel luminous bands, often in rapid, collective motion, occasionally stationary.

• Light wheels. Long spokes of light rotating about a common hub.

•Expanding rings of light. Some,are concentric, others separated.

•Milky seas or white water. In which the whole sea surface glows like a neón light bulb rertdering the sky above black as pitch.

•Te lapa. Streaks or flashes of light beneath the sea surface seemingly emanating from land masses still beyond the horizon.

•Miscellaneous marine luminosities. Varied light shows, deep-sea-vent glows.

LUMINOUS BANDS

HORIZON-TO-HORIZON BIOLUMINESCENT BUBBLING BAND

June 5, 1995. East China Sea. Aboard the m.v. Tokyo Bay enroute Busan to Kaohsiung.

At 1830 UTC whilst the ship was on a course of 218° at 21.5 knots, what seemed to be hundreds of fishing lights were seen right ahead of the ship and stretching from horizon to horizon. As the ship approached them, it became apparent that the lights were bioluminescence.

The appearance was like large single 'blobs' approximately the^ size of tennis baila, while at the main concentration the water seemed to be 'bubbling up' in a line stretching to both horizons. When the ship passed through the line, the lumineseence gave off such a glare, as bright as daylight, that it was possible to read the identification numbers of the con- tainers on the focsle. The duration of the phenomenon was about 5 minutes or 1.5 n.mile.

(Hughan, D.S.; "Bioluminescence,[11] Marine Observer, 66:62, 1996)

Comment. P.J. Herring, Southampton Oceanography Centre, called this dis- play "a most anusual account which I am unable to interpret." He opined that the blobs were probably cylindrical colonies of luminous sea squirts, but he could not account for the 1.5-mile- wide, horizon-to-horizon bright glare and associated bubbling.

Gulf of México, 1908. The sketch shows one of two, very wide, parallel, bands of bioluminescence that stretched from horizon-to-horizon.

HORIZON-TO-HORIZON BIOLUMINESCENT BANDS

September 24, 2002. South Atlantic. Aboard the R.R.S. James Clark Ross.

On passage from Grimsby, the ship was approaching Ascensión Island from the riorth-north-west when fieveral bands and patches of bio- luminescence were observed between approximately 0500 UTC and 0530.
The stationary, parallel bands were estimated to be between four and five metres wide, stretching as far as the eye could see on both sides of the. ship, and lying between 110° and 290°. The bands and patches were composed of dense organisms, having the appearance in both intensity and size to small green diode indicator lights. The ship's searchlights and the Aldis signal lamp were shone on them but no apparent effect was observed.

(Elliott, C. R.; "Bioluminescence," Marine Observer, 73:62, 2003.)

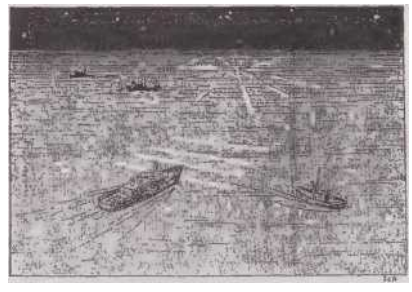
Comment. Geometrically organized bio- luminescent displays are rare in the Atlantic, being primarily phenomena of the Indian Ocean and South China Sea.

LIGHT WHEELS

AN ASTONISHING MEDLEY OF BIO-LUMINESCENT DISPLAYS

April 30, 1994. Strait of Hormuz. Aboard the m.v. BP Argosy enroute to Jubail.

At around 1710 UTC large but faint whitish patches of bioluminescence were observed on the port side of the vessel; they were fast-moving with random directions of movement. Over the next five minutes the intensity of the bioluminescence increased to patches of brilliant flourescent green, while the random pattern of movement suddenly changed to fast- moving parallel bands heading toward the vessel. The pattern then changed again to form numerous rotating spi- rals: some were confirmed to be rotating anti-clockwise but it was diffi- cult to assess owing to the large



High-speed bars of light approached a vessel in the East Indian Archipelago in 1959. A rotating phosphorescent light wheel can be seen in the distance.

number of overlapping patterns.

At this point the vessel was surruunded by the phenomenon to a distance of approximately 1 n. mile radius. Yet again the patterns chang- ed, this time to parallel concentric circles moving outwards from numer- ous centres. The display started to decrease at 1725, returning to milky- white patches before eventually disappearing at 1730.

(Watnon, M.M.; "Bioluminescence," Marine Observer, 65:59, 1995)

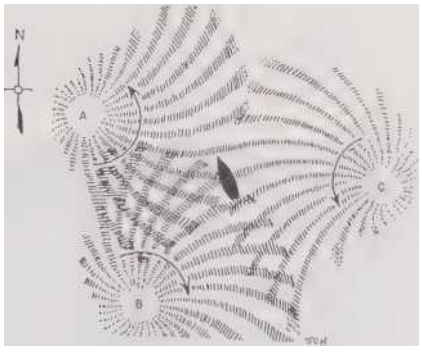
May 23, 1994. Equatorial Atlantic. Aboard the m.v. Taunton enroute to Richards Bay.

At 0550 UTC the vessel was passing through an area of thunderstorms with modérate to heavy rain and the nearest area of lightning was about 4 n. mile away when the Chief Officer went onto the bridge to observe some bioluminescence. At this point he noted that the hairs of his arms and moustache were glowing with a bluish light although no tingling or any other sensation was felt. A check of the vessel's aerials revealed no traces of 'St Elmo's fire' and the observer seemed to be the only ob- ject affected. The glow disappeared once he retreated to the wheel-house but reformed when he went outside again but without the same intensity.

What was noticeable was that the bioluminescence was only seen at the same times as the St. Elmo's fire, and the observer was left wondering whether it appeared in response to a heavy static charge in the air.

(Nicholls, G.; "Bioluminescence," Marine Observer, 65:69. 1995)

Comments. We see in the first account remarkable changes in patterns and colors, all in the same display. Such collective action (?) by multitudes of tiny marine bioluminescent organisms is much more impressive than Malaysia's synchronized firefly displays. But the second account hints that perhaps exter- nal electrical fields may stimulate the patterns. See vol. 1 and our catalog Remarkable Luminous Phenomena for several cases of radar-stimulated bioluminescent phenomena.



Gulf of Thailand. 1953, Three overlapping marine light wheels -were observed spinning simultaneously.

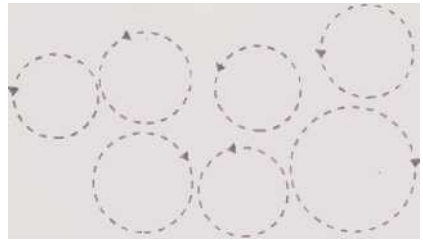
MULTIPLE PHOSPHORESCENT WHEELS

April 17, 1995. Strait of Hormuz in the Persian Gulf. Aboard the m.v. British Reliance, enroute Fujairah to Kharg Is- land. Observers: the Master and Second Officer.

At 1525 UTC whilst in the westbound lañe of the Traffic Separation Scheme and shortly after settling on a course of 270°, a small amount of blue phosphorescence was noticed in the sea waves ahead (the swell being very low). Suddenly, the wind appeared to blow quite strongly, swirling around the vessel and then for as far as the eye could see and all around the ves- sel, phosphorescent cartwheels of bright-blue light began forming. The bands of light were roughly 30 cm thick while the máximum diameter of the wheels was 15-18 m.

Their direction of movement seemed random and they were spinning at high speed, some chasing each other, others spinning in opposite direetions next to each other, see sketch.

Whole groups dumbbelled around each other, all spinning in apparently random direetions. The display lasted for about 18 minutes before petering out.



Persian Gulf, 1995. The erew of the m.v. British Reliance encountered a complex of several marine light wheels rotating in the senses indicated by the arrows.

A comment by P.J. Herring of the Southampton Oceanography Centre followed.

A quite extraordinary account of phosphorescent wheels occurring in one of the places where they are most often seen. In the 200, or so, cases of this phenomenon reported in the last 100 years, never have so many wheels been described so cióse together, ñor has there been any association with wind change. I am very intrigued but at a complete loss to explain how the wheels were pro- duced.

(Greig, N.J.; "Bioluminescence," Marine Observer, 66:62, 1996)

HARE NORTH ATLANTIC LIGHT WHEEL

April 30, 1981. North Atlantic Ocean.

At exactly 2155 GMT, a white sea- smoke type mist was observed glowing white between 2 and 5 metres above the sea surface. Further observation revealed that we were entering a large area of circulating bioluminescence of defined spiral form which appeared to be a palé emerald green in colour. Although the direction of rotation and the centre hub of the wheel could not be determined, the bands appeared to be of great dimensión. While still proceeding through the bioluminescence and observing astern, it was noted that the forma- • tion of the bands became disrupted and seemed to diffuse a ragged ap- pearance at the perimeter of the wheel to the port side of the vessel. Judging by the distance of the vesseis cióse by-----which were being tracked by radar------the extent of the rotating bands to the west could not be determined but they were estimated to be between 1 and *i* n. mile. The duration of the phenomenon was 4i minutes from entering to leaving the bioluminescence.

(Lehepuu, K.; "Bioluminescence," Marine Observer, 52:76, 1982)

Comment. Bright marine bioluminescence is not uncommon in the Atlantic, particularly in warm waters, but it is very unusual to find geometrically organized displays. The light wheels seen in the Persian Gulf and South China Sea are more frequent and more highly structured. No one has ever come up with a good explanation of ho*vt* simple marine organisms cooperate to produce such large, complex, rotating displays.

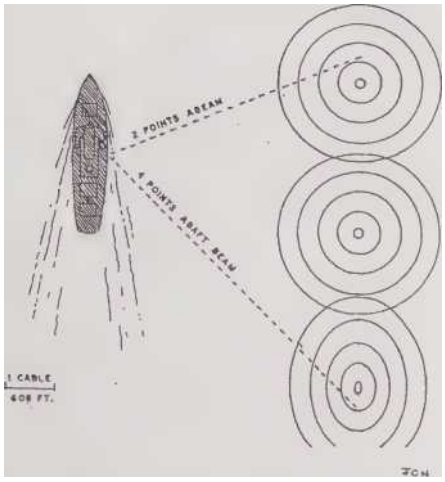
EXPANDING RINGS OF LIGHT

EXPANDING LUMINESCENT RINGS

March 26, 1993. Strait of Hormuz, Persian Gulf. Aboard the m.v. Liverpool Bay, Jeddah to Jebel Ali.

At 1540 UTC while the vessel was transiting the Strait of Hormuz westbound, within the traffic separation scheme, it was strangely illuminated for several minutes by what turned out to be bioluminescent organisms. Bearing in mind the size of the ves- sel and the height of the containers above the water (about 25 m) the intensity of the light produced was remarkable.

The first appearance could only be described as something out of a Science fíction novel, as the vessel moved through a wave-like form of light which initially appeared to be above the water in the pitch-black night. Shortly afterwards an area to port at a distance of several hundred metres exhibited an even more amaz- ing display of concentric circles ema- nating from a single point; the star- board side maintained the more broken



In 1960, in the Gulf of Ornan, three sets of expanding, concentric rings of light appeared—two were circular, one elliptical.

wave form but retained the same intensity of light. The vessel and deek containers were illuminated by an eerie and variable glow.

(Welch, J.W.j "Bioluminescence,'' Marine Observer, 64:14, 1994)

PHOSPHORESCENT RINGS AND YíHEELS

October 13, 1996. Arabian Gulf. Aboard the tanker Arabiyah.

Expanding phosphorescent rings were observed emanating from a single point. These rings were equally spaced and expanded outwards for about 500 meters before disappearing. Rings with spoke systems also formed, rotating clockwise. The observers had the distinct impres- sion that the rings were above the sea surface.

We have reported on so many of these light wheels in the past 22 years that we have skimped on the details in favor of the comments made by P. Herring of the Southampton Oceanography Centre.

This is a fascinating account of the most spectacular (and rare) biolumi- nescent phenomenon known (I have a record of some 250 reporta in the last 100 years). These wheels/rings occur in relatively shallow water and are most frequently encountered in the Arabian Gulf and Bay of Bengal. The is no agreed cause, though some scientists have suggested seismic dis- turbances on the sea floor may be responsible.

(Kent, D.R.; "Phosphorescent Wheels," Marine Observer, 67:192, 1997)

Comment. The frequent impression that these marine phosphorescent phenomena occur above the water surface is always puzzling because the bioluminescent organisms supposedly responsible are below the surface.

MILKY SEAS OR WHITE WATER

SEA OF MILK

The "milky sea" phenomenon is far from rare in the Indian Ocean. As of 1993, scientists had accumulated 235 observa- tions of these eerie luminous displays. Almost all of these observations come from the Indian Ocean, particularly the northwestern section. (vol. 1, p. 260) This exclusive nature of the milky sea makes the following observation from the North Atlantic in 1931 all the more re- markable.

A phenomenon on the Atlantic resembling a "sea of milk" has just been reported to the local hydro- graphic office by A.V. Potter, third officer of the British steamship Asphalion.

Steaming into a heavy Southwest swell, the Asphalion was recently in the Atlantic at Lat. 12 degrees 51 minutes N., Long. 54 degrees 55 minutes W. when rough broken seas were met, Potter reported. The water, however, appeared to be smooth, because each combing brea- ker left a shadowless wake of white, boiling water.

"The expanse of water had every semblance of a sea of milk," he reported. The phenomenon continued for five hours, throwing the horizon of ihk-black sky and milky sea into bold eontrast.

(Anonymous; "'Sea of Milk' in Atlantic Reported by British Sailor," New York Times, November 1, 1931. Cr. M. Piech- ota.)

Comment. It is generally assumed that milky seas are caused by bioluminescent organisms, possibly bacteria; but this has never been proved. Indeed, water samples reveal nothing. Mystery also surrounds the phenomenon's curious geographical distribution. There are many tropical seas just as promising as the northwestern Indian Ocean; and, then, there is a correlation with the monsoon season. Bioluminescent displays are almost totally ignored by Science I

ANOTHER MILKY SEA

January 25, 1995. Indian Ocean. Aboard the s.s. Lima, Juaymah to Rotterdam. Third officer, S.M.F. Masud, and others of the ship's company observed another instance of oné of the sea's great unex- plained phenomena.

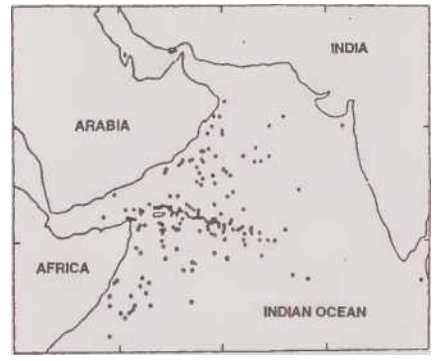
At 1800 UTC on a clear moonless night while 150 n.mile east of the Somalian coast a whitish glow was observed on the horizon and, after 15 minutes of steaming, the ship was completely surrounded by a sea of milky-white colour with a fairly uni- form luminescence. The biolumine- scence appeared to cover the en tire sea area, from horizon to horizon but above the surface, and it appeared as though the ship was sailing over a field of snow or gliding over the clouds.

There was no damping effe--'t on capillary waves or reduction of visibility at all and there was no mist at deck level although at a distance it seemed as if there was either low-lying mist or the upwelling óf the luminescence itself. The bow waves and the wake appeared blackish in colour and thick black patches of oil were passing by. Later, the Aldis lamp revealed that the 'oil patches' were actually light-green kelp, amazingly black against the white water.

A water sample contained many single-celled microorganisms, but they displayed no luminescence. After 6 hours, the luminescence disappeared.

Commenting on this report, P.J, Herring, of the Southhampton Oceanography Centre, said that milky seas are most often associated with the Southwest Monsoon. This one was was rare in that the Northeast Monsoon prevailed. His final remark was: "The mystery of its cause remains unsolved."

(Briand, J.P.; "Bioluminescence," Marine Observer, 66:12, 1996)



Milky-sea reports are most common in the northwestern Indian Ocean.

MILKY-SEA PHENOMENON

June 21, 2002. Banda Sea, Eastern Indonesia. Aboard the Northwest Stormpetrel.

During the 4-8 watch (2000 UTC) the vessel entered an area of bioluminescence that covered the sea surface out to all points of the horizon. The glow from the luminescence was uniform all over, with black patches forming down the sides owing to the bow wave. The intensity of the glow increased to approximately 2045 after which it started to dim and become patchy. At around 2100 the ship left the affected area, there being a distinct line astern.

Milky sea or "white water" is widely thought to be due to luminous bacteria growing on a scum of phytoplankton.

(Lewis, P.; "Bioluminescence," Marine Observer, 73:11,. 2003)

Comment. Milky seas are often so bright that the Bky appears pitch black. No one has identified any bacteria that can produce the observed light intensities.

PSYCHEDELIC PHENOMENON

O^tober 3, 1995. Strait of Hormuz. Aboard the m.v. Chilham Castle enroute Karachi to Kuwait.

At about 2240 UTC, the observers saw a strange effect in the sea stre- tching for approximately 100 m from the parallel body. It was a soft white light, almost strobe-like in character that pulsed irregularly. The light was bright enough to illuminate the wheel- house deckhead and seemed to ema- nate from below the water, almost as if something was shining a spotlight upwards, shimmering and twirling: psychedelic projections of the 1960s were brought to mind. Curiously, the wash from the bow was not illum- inated and appeared normal, likewise the wake.

The phenomenon lasted for 6 or 7 minutes, faded, and then reappeared briefly. The night was elear and the visibility excellent.

(Griffiths, P.J.; "Bioluminescence," Marine Observer, 66:183, 1996)

Commem. The comparison to an under- water spotlight shining upward from the depths appears frequently in accounts of abnormal marine luminescence. Note particularly the unlit bow wash and wake. In normal biolumineseent displays, so common in tropical waters, these features are bright-----as Kipling expres- sed so vividly: "The wake's a welt of light that holds the hot sky tame." (From: L'Bnvoi)

TE LAPA

TE LAPA: HNDERWATER LIGHTNING

In our catalog Remarkable luminous Phenomena, we deseribed "te lapa" as follows:

Streaks of light, flashes, and glowing plaques appearing well below the sur- face of the ocean, apparently emana- ting from distant land masses. Sup- posedly used by Polynesian navigators.

These streaks of light seem to dart out írum the directions in which islands lie and, therefore, can served as navi- gational cues.

At the time we w.rote the above catalog, the only source we had that men- tioned te lapa was an article from the National Geographic (146:751, 1974). To lapa seemed so bizarre that we were uncertain about its reality. However, R. Riley has passed along two additional references to "te lapa," namely, two books by David Lewis entitled: We the Navigators (1972) and The Voyaging Stars (1978). ----------⁶—*

Apparently "te lapa" is familiar to natives throughout Oceania. In Tonga, it is called "ulo a e tahi" and, in the Gilberts, "te mata."

(Riley, Rachel; personal communication, February 1, 1994)

MISCELLANEOUS MARINE LUM INOIS IT IES

DNKNOWN SPECIES PDTS ON SPECTACULAR LIGHT SHOW

January 18, 2001. Indian Ocean. On the m.v. Shenzhen Bay Columbo to Suez.

The show commenced at 1635 UTC with random camera-like light flashes on the water surface around the ves sel. At 1705 the main event began.

On the port side of the vessel were numerous bright blue-green lights just beyond the waves created by the ship. These 'blobs' of light appeared to well up to the surface in line with the port bridge wing, and their num- bers could be estimated in hundreds at any one time----together they pro- duced a very intense glow. The lights appeared to be following the ship, the creatures perhaps being attracted by its lights since they could only really be seen on the port side where the accommodation lighting was brighter.

Then, at around 1715, thé Third Officer, tried a few experiments with the Aldis lamp. The results were dramatic! Wherever the light was shone, the creatures welled up to the surface in even greater numbers; zigzag patterns, squares and circles could be conjured up at will using their reaction to the lamp.

The human-directed light show lasted until 1745. At its peak the sea was lit out to a distance of 70 meters.

Several marine species are well known to emit light when stimulated by light. However, bioluminescence expert P.J. Herring admitted he was baffled by the above performance. He said that the likely biolumineseent candidates were small crustaceans called "ostracods" and larger animáis called named "pyrosomes." The ostracods, though, were much too small to create the observed light show, while the pyrosomes never "welled up" as deseribed.

(Dodworth, J.; "Luminescence," Marine Observer, 72:10, 2002)

THE VENT GLOW AND "BLIND" SHRIMP

In 1988, when the research submersible Alvin was exploring those remarkable hydrothermal vents or "black smokers." Its CCD (Charge-Coupled Device) camera detected a ghostly glow emanating from the vents. Since this mineral-laden water gushing from these cracks ín the deep-sea floor exits at 350°-400°C, the simplest explanation of the vent glow is that is is simply thermal radiation from the hot fluid. Indeed, color filters on the camera recorded a spectrum cióse to that of a 350°C plume.

But the deep-sea shrimp camped around the vents have raised second thoughts. The shrimp, only a few inebes long, live in the perpetual darkness of the miles-deep vents. They do not need and do not have ordinary eyes. Rather, they sport a mysterious organ on their backs that is connected to their brains by a nerve-fiber bundle much like an optic nerve. This organ is packed with the same light-sensitive pigments found in the eyes of surface creatures. Despite its unusual location on the shrimp, it is an "eye" of sorts. But of what use is it in the Stygian abysses? To find, perhaps, vent glows that betray the presence of chemosynthetic food sources. If this is so, the shrimps' optical organ, which is most sensitive in the blue- green portion of the spectrum, is badly mis- matched to the infrared of the vent glow. It is a truism that nature is a perfec- tionist and would not tolérate such bad design. The eyes of animáis are always well-tuned to their ways of life. Some possible conclusions: (1) The vent glows are not entirely due to thermal radiation; (2) The shrimps[1] organ is tuned to "something else"; and (3) The vent- shrimp link is recent, and evolu- tion has not yet had time to fine-tune the shrimps' "eye."

(Travis, John; "Probing the Unsolved Mysteries of the Deep," Science, 259: 1124, 1993)

WEATHER PHENOMENA

UNUSUALCLOUDS

POLAE BANDS

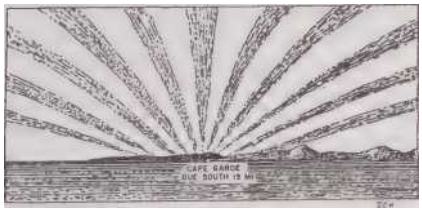
November 24, 1883. Corinth, Mississippi.

T.E. Whitñeld, the Chief Signal Ofñcer at this location, reported polar-aligned cloud banda.

> The phenomenon waa obaerved at 7 p.m., when twelve well-deflned banda of dark cloude were aeen diverging from a point beneath the "north" star. Four of these band8 were eaat of the Btar named, and the remaining eight were west of it, thoae near the weatern limit of the diaplay being ahorter and leaa inclined toward the horizon. The lower ende of the seven largeat clouda terrainated abruptly at an equal diatance from a common point near the northern horizon, leaving an almoat perfect Bemicircle of olear sky beneath, from which the banda radiated like the apokea of a wheel.

(Anonymoua; Monthly Weather Review, 11:264, 1883)

Comment. Polar banda aeem to converge near the horizon, but thia ia illuaory; tliey are actually parallel. The seientiñc puzzle ia why they are ao often aligned in a north-south direction. The earth'a magnetic field should not affeet cloud patternB. See our catalog Tornadoa, Dark Pay8 for additional caae8.



Typical polar cloud bands as seen off Cape Garde in the Mediterranean in 1927.

RIBBONS IN THE SKY

November 18, 1999. North Atlantic Ocean. Ahnnrd the m.v. Waterford enroute from Pto Bolivar, Columbia, to Ijmuiden.

> At 1832 UTC an azimuth of Júpiter waB taken ahortly after aunaet. The sky in the vicinity of Júpiter waa completely clear, no cloud of any type, with but a few small cumulua dotted around the horizon.
>
> About five minutea later, having completed the calculationa, the obser- ver again looked out to aee a ribbon type cloud, broken in formation, atretching almoat from [the] eaatern horizon to [the] weatern horizon. If the eatimated height (aee below) ia reaaonably correct, then the band- width couldn't have been more than a few hundred feet, apparently more cigar-ahaped in croaa aection than fíat, the máximum axia being horizontal, the minimum vertical. The cloud waa fairly conaiatent in deneity, and at a fairly atable altitude, not undu- lating or rippled, having the consis- tency of a amall cumulua cloud (white and fleecy), but aleo tranalucent.
>
> Initially, it waa thought to be a condenaation trail, but thia waa ahortly diamiaaed aB it waa conaidered too low (eatimated to be leaa than 10,000 ft altitude, probably around 7,000 8,0 ft). Both ende of the cloud were checked with binoculara but no aircraft waa evident; however, aa a yardatick, and by good fortune, one did appear around 1910, preaumed to be at the uaual 30,000 or ao feet, heading weat- aouth-weatward.

(Bennett, Paul; "Ribbona in the Sky," Marine Obaerver, 70:177, 2000)

Comment. If not a condenaation trail, the next beat gueaa would be a meteor trail, although the altitude ia alBO very low for one. A bolide atreaking acroaa the aky at auch a low altitude at night would have created a apectacular lumi- nous diaplay and probably conBiderable aound aa well.

AMAZONS IN THE SKY

No, we are not talking about the jet atream8. Rather, we refer to the curi- ous "fllamentary atructurea" aeen on water-vapor map8 of the tropoaphere. (The tropoaphere ia roughly the lower 10-20 kilometera of the atmoaphere.) These fllaments are many times longer than they are wide, and deserve to be called "rivera." These aerial streams of water vapor develop in regular pat- terns and pereist as they are trans- lated through the tropoaphere. It ia the huge qufuitity of water vapor car- ried by these aerial rivers that make them worthy of note here. Eepecially remarkable is the river that frequently flows south from Brazil to eaat of the Andes and thence southeast into the Atlantic.

> A typical flow in thia South American tropospheric river is very cióse to that in the Amazon (about 165 x 10^6 kg sec^{-1}). There are typically five rivers leading into the middle latitudes of the Southern Hemisphere and four or five leading into the Northern Hemisphere. The rivera per- aist for 10 days or more while being translated generallv eastwards at speeds of 6 m sec^{-1}.

(Newell, Reginald E., et al; "Tropospheric Rivers?-A Pilot Study," Geo- physical Research Letters, 19:2401, 1992)

CONCENTRIC RING CLOUDS

June 15, 1963. North Pacific. Aboard the S. S. Elizabethport enroute from the Panama Canal to Long Beach, California.

> ...an unusual cloud waa observed. It waa composed of four concentric rings and puré white. It bore 280°, altitude 35°. It appeared above lar ge cumulua clouda which were tinged with gray and palé yellowish tinta. Two other clouds similar but of leas regular formation were observed at the samé time.

(Anonymoua; "Cloud Formation," Notices t& Marinera, July 20, 1963. Cr. B. Greenwood)

Comment. No recognized meteorological mechanism produces concentric ring clouds. However, rocket launches may create weird cloud formations. This ship's position (7°10' N, 81°26' W) and the cloud's azimuth make the missile explanation unlikely, even for launches from California. For- other ring clouds, see our catalog Tornados, Dark Days.

UNUSDAL CIRCOLATING CLOUD OBJECT

July 24, 1996. Malborough, South Devon.

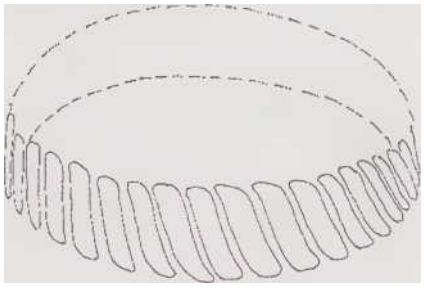
About midnight on this date, E. Netley and his wife observed a most peculiar cloud formation. It waa so well-forraed and precisely organized that Netley felt that the term "cloud objeet" waa appro- priate. Even so, he waa confldent that the apparition represented a natural phenomenon. "Natural" probably, but certainly the strangest cloud we have encountered in 30 years of literature research.

The evening of July 23 waa warm and a bit humid, with a modest breeze blow- ing in from the ocean. Netley and wife first saw the "cloud objeet" from a dis- tance of about a kilometer; they event- ually walked to within 400 meters of the phenomenon. The "objeet" consisted of a slowly rotating ring of thin, vertically oriented clouds. (See figure.) The cloud ring was 80-100 meters across and seem- ed to roíate in a horizontal plañe at the rate of about one revolution per minute.

As though this were not strange enough, the rotating "cloud objeet" it- self moved in a larger circle 8-10 times the diameter of the "cloud objeet." The

"cloud object" took 4-5 minutes to complete a trip around the larger córele. The phenomenon lasted for about an hour before dissipating.

(Netley, Edward; "Unusual Circulating Cloud Object," Journal of Meteorology, U.K,, 21:384, 1996)



Sketch of the revolving "cloud object." Part of the circle is omitted for clarity. Like a wheel-within-a-wheel, the circle- as-a-whole seemed to trace out a larger circular path!

MORE ON THE 1984 "MYSTERY CLODD"

The 1980s saw a suecession of puzzling cloud phenomena. First, there was the "mystery cloud" of April 9, 1984, which was likened to the mushroom cloud rising after a nuclear detonationj and, second, American satellites photographed several strange, horizontal cloud plumes over Soviet Arctic islands. Secret Soviet weapon tests were suspected in both in- stances. (vol. 1, p. 265) The locations and shapes of the two phenomena sug- gest that the two types of clouds actual- ly had different origins.

A 1985 report in the New York Times provides some information about the first mystery cloud not recorded in past issues of Science Frontiers. The event described below took place some 400 kilometers east of Japan.

> It was so cióse to cargo-laden Flight 36 of Japan Airlines that the plane's commander, Capt. Charles H. McDade, swerved away from it, began a rapid descent, ordered hiB crew to put on oxygen masks and radioed a "May Day" distress cali.
>
> "Looks like a nuclear explosión, only there was no fireball," he told flight controllers in Alaska. His plañe was slightly jostled. "I turned tail and ran," he said later.
>
> The crews of KLM and Flying Tiger airliners, also heading toward Alaska, saw the cloud too. Alt were flying above a 14,000-foot cloud deck from which a bulb appeared, soarlng at an estimated 500 miles an hour.
>
> The bulb rapidly expanded to a diameter of 200 miles—the distance between New York and Washington— then thinned and disappeared above 65,0 feet.

(Sullivan, Walter; "A Mushroom Cloud Remains Onexplained a Year after Sighting," New York Times, May 21, 1985)

No light flash was observed, although the cloud was reported to be slightly luminous. Recourse to seismic records, microbarograph data, and reports from planes monitoring atmospheric radio- activity yielded nothing. Yolcanic erup- tions and a nuclear explosión seemed to be ruled out. The "mystery cloud" re- mained just that.

To researchers A.C. Chang and J.A. Burnetti, a high-velocity meteor smash- ing into the cloud deck appeared to be a better hypothesis. A meteor encoun- tering the cloud deck might have shat- tered into many fragmenta, converting the meteor's kinetic energy into heat.
The hot gas would then expand into a mushroom shape. No Soviet activity would be involved, and everyone could relax!

(Chang, Andre C., and Burnetti, James A.; "Mushroom Cloud the Result of a Meteor?" Nature, 314:676, 1985)

Comment. Meteors usually create vivid luminous phenomena when they enter the atmosphere; but none was seen. To this date, we have not seen a consensúa hypothesis on the origin of this event.

GREEN THDNDERSTORMS

Anecdotes abound that exeeptionally severe thunderstorms may appear to emit an eerie, sickeningly yellow-green light. Skeptics scoff at this notion. The excited ob servers were deluded, or they made it all up. This is, of course, the same knee-jerk response greeting UFO reports and accounts of many other anomalies. Thunderstorms, however, do have an objective existence. And it turns out that a few storm-watching meteorolo- gists have also seen greenish thunderstorms. Such professi'onal testimony is usually dismis sed as due to the reflec- tion of greenish ground vegetation by the storm clouds or, perhaps, the effects of sheets of hail preceding the storms.

In 1995, F.W. Gallagher et al decided to settle the matter. They chased likely looking thunderstorms armed with a spectrophotometer. Many storms later, they proved-, first of «11, that some thunderstorms are definitely green. In faet, some gradually change from blue to green in the space of half an hour. Their ground observations, plus more spectrophotometer data taken from air- craft, refute the theory that the green color is from reflected vegetation. Hail may contribute to the green color but is not required. In sum, green thunderstorms really do exist, but no one yet knows where all the green comes from.

(Gallagher, Frank W., III, et al; "Green Thunderstorms Observed," Amer- ican Meteorológica! Society, Bulletin, 77:2889, 1996)

FOGS AND DUST VEILS

DRY FOGS AND BRIGHT NIGHTS

June 1783. Much of Europe.

> .. .the atmosphere was suddenly invaded, in Europe, by a sort of dry fog of peculiar qharacter. It did not moisten objects, did not affect the hygrometer, and persisted when the wind rose, and rain fell. The sur. looked palé through it. This fog lasted a month. One curious point is, that it was phosphorescent, and gave a light like moonlight at night.

August 18, 1821. Western Europe.

> ... a similar fog was observed throughout Western Europe; it lasted twelve days. It deprived the sun of so much brightness, that one could look at this star at any hour; it gave the disc a glossy blue tint. Twilight assumed an extraordinary brightness, so that the day was greatly pro- longed, and one could even read at midnight.

(Houzeau, M.; "On Certain Enigmas of Astronomy," English Mechanic, 29:32. 1879) ;—

THF 536 AD DUST-VEIL FVENT

Circa 536 AD, our planet suffered a great geophysical calamity, as proved in tree-ring measurements and human records of the period. Until astronomi- cal catastrophism became more fashion- able in recent years, the so-ealled "dust-veil" event of 536 AD was blamed on a huge volcanic eruption. Work by M.G.L. Baillie now casts doubt upon interpretation.

> Now tree-ring data, published by Professor Mike Baillie of Queens University of Belfast, has brought catastrophes almost into modern times. The tree rings show that in the mid 530s —just about the time civilisation on Earth suffered a sharp setback there was a sudden de
> cline in the rate of tree growth which lasted about 15 years. Clearly, something dramatic had happened.
>
> There are two possibilities: a huge volcanic eruption or a collision between the Earth and a solid object: an asteroid or comet. Ice-cores driliea from Greenland show no evidence of large- scale volcanic activity at that time, so Professor Baillie and others now believe a cosmic impact is more likely. The result would have been to throw up a huge veil of dust and debris, cooling the Earth and pro-

ducing widespread crop failures.

(Anonymous; "Raining Death and Dark Ages," London Times, July 27, 1994.
Cr. A. Rothovius.)

In the scientific literature, Baillie has elaborated on the cosmie-projectile theme, adding that the dust veil could also have been ereated when the solar system passed through a cloud of cosmlc dust.

(Baillie, M.G.L.; "Dendrochronology Raises Questions about the N ature oí' the AD 536 Dust-Veil Event," The Holo- eene, 4:212, 1994. Cr. L. Ellenberger.)

Comment. The scientific literature hints of dust-veil events in more recent times:

(1) the white-sky phenomenon of 1912; and

(2) the "dry fog" of 1783.

See details in GWC1 and GWD4 in our catalog Tornados, Dark Days.

ANOMALOUS “FALLS”

HYDROMETEORS

ICE "METEORITES" FALL

When ehunks of ice much larger than those often-reported "softbaH-sized" hailstones fall, they are termed "hydro- meteors." Many hydrometeors have been reported in the meteorological journals. (See GWF1 in our catalog Tornados,
Dark Days) While some of these large ehunks can be blamed on aircraft with leaky toilets, many others cannot be explained so easily. Some may truly come fr'jm deep space. Seeing that comets and Saturn's rings are composed mostly of ice, there seems to be no shortage of ice in outer space. It is therefore strange that aircraft are routinely blamed for aU falls.

A Reuter's dispatch from Beijing has described a recent triplet of possible hydrometeors:

> Chinese experts have recovered what they believe to be ehunks of meteoric ice that fell to Earth in Zhejiang Pro- vince, Xinhua news ageney said.
>
> Amateur geologist Zhong Gongpei was nearby March 23, when farmers saw three large ehunks of ice crash with a whoosh into paddy fields at Yaodou village, Xinhua said late Saturday.
>
> "According to witnesses, it fell with a 'whoo-ing' sound, with a cloudy streak, then carne crashing down into three fields about one kilo- metre apart," Xinhua said.
>
> Zhong rushed to the scene, recovered two pieces and sent both to Purple Mountain [Observatoryl on March 29 with the aid of a frozen- food company, which kept them from melting.
>
> The largest chunk, now about the size of a fist, left a cráter about one metre in diameter.
>
> "They are white, semi-transparent, with an irregular shape and what are apparently air bubbles on both the surface and inside the ice. Unhke manmade ice, the ice has air bubbles, is relatively light and doesn't have the layered structure of hailstones," he said.

(Anonymous; "Ice Meteorites Hit Rice Field," Toronto Sun, April 3, 1995. Cr.
G. Duplantier and L. Farish.)

TARGET: SOUTHERN SPAIN

Early in January 2000, Southern Spain was bombarded with at least 30 rather large blocks of ice, some weighing 4 kilos (about 9 pounds). Chemists at the University of Valencia found none of the microorganisms that would identify the ice ehunks as falling off aircraft with leaky toilets. One frozen projectile hit an automobile, but the driver was not hurt; another glanced off the shoulder of an elderly woman living in Almería.

As to be expected, the Spanish news- papers played the phenomena for all they could. Also to be expected were a few fraudulent reporte. It waB all great fun, but scientific explanations for the bona fide hydrometeors are lacking.

(Anonymous; "Fortean Ice," New Scien- tist, p. 5, January 29, 2000. We also made use of several Ítems posted on the Web. Cr. E. Murphy and COUD-I.)

Comment. It is extremely rare for ordi- nary meteorites to hit humans or their structures. Yet, in this icy Spanish fusillade involving only a small handful of ice ehunks there were two humans involved. Suspicious!

REVISITING THE SPANISH HYDROMETEORS OF JANUARY 2000

The hydrometeors we reported above involved about 30 ice blocks in the kilo- gram range. They fell on a sunny day in Southern Spain. Happily, some of these large ice ehunks were retrieved and pre- servad by Spanish scientists. Some of the findings have been reported in Science, which is in itself an anomaly, con- sidering the Fortean nature of the events.

The analysis of the preserved ice blocks revealed none of the contaminante typical of aircraft lavatories. In fact, no large aircraft were overflying the región when the ice blocks crashed to the ground. Neither were the ice masses extraterrestrial in composition (i.e.; no eometary debris or the like). They con- sisted simply of frozen terrestrial rain- water.

When sawn up, the blocks were seen to be chock-full of air bubbles. Some onion-skin layering also appeared. The contained gases, such as ammonia, and particulates suggested that—despite their size and the clement weather---- they were just hailstones! But they were certainly not ordinary hailstones and where could they have come from?

A radical "hailstone" theory has been advanced, based upon the unusually coid and moist upper atmosphere present at the time. If ice nuclei existed, say 19 kilometers high, and they took 10 minutes to fall. to earth; it is conceivable that hailstones of the size collected might form. Given the fair weather, the only ice nuclei one can imagine would be in the lingering contrails of high-flying jets. These can persist for days.

However, few meteorlogists are buy- ting the clear-sky hail theory.

(Bosch, Xavier; "Great Balls of Ice," Science, 297:765, 2002.)

7-TO-8 KILOGRAM ICE BLOCK FALLS ON SWITZERLAND

July 26, 1998, Rué, Switzerland.

> On Sunday July 26, 1998, at around 9^45ᵐ Central European Daylight-Saving Time (7^¹45ᵐ UT), a Rué farming couple were in front of their house when they heard a whistling sound "like a big rocket on August 1" (Swiss national holiday). They just had time to see a block of ice the size of a "football" pass in front of their field of visión and crash into the tarred path near to their farm.
>
> The block broke up into thousands of pieces and the witness recuperated [sic] the largest which was "the size of a skittle." The ice was "very hard" and "snow-colored."
>
> The witness estimated the weight of the ice block at 7-8 kg and the piece he was able to recupérate at 6-7 kg. Unfortunately, he did not thihk of conserving the block in the freezer, and let it melt near his house after having shown it to his neighbor, who had also heard the noise.

Swiss aviation officials claimed they could not identify any aircraft that might have been responsible "because of incertitude over the time of the incident"!

(Mancusi, Bruno; "A Block of Ice Falls on Rué, Switzerland," WGN, the Journal of the IMO, 27:2, 1999. WGN = Werk-groepnieuws.)

ANIMAL FALLS

FROG FALL

June 16, 1937. Frackville- Pennsylvania.

Astonished householders of this little mining town, ten miles north of Potts- vüle, went out with brooms and swept bullfrogs off their open porches after a thunderstorm today.

The tiny frogs sounded like the thudding of hailstones as they drop- ped by hundreds on fin roofs.

Miniature "twisters" accompanying the rain had lifted the frogs several yards into the air, it was suggested, and dropped them over Frackville.

(Anonymous; "Bullfrogs by the Hundred Fall in Pennsylvania Rain," New York Times, June 17, 1937. Cr. M. Piechota.)

Comment. The "whirlwind theory" is al- ways trotted out to- account for fish, frog, and toad falls. It is not easy to ñnd hundreds of tiny frogs in a marsh and then vacuum them up without also Jevitating considerable plant debris and other marsh dwellers.

NACH STORM REGNETE ES FISCHE ADF DIE FELDER

After a heavy storm, it rained sardines in northern Greeee. A whirlwind had sucked water out of the sea at Thessa- loniki and carried the tiny fish along several kilometers into the interior.
"We could not believe our eyes. The fields and woods were covered with tiny fish," reported an inhabitant of the village of Korona.

(Anonymous; Kurier (Austria^ Deeember 12, 2002. Cr. and translation by O. Stummer.)

HIGH-FLYING CATFISH

Anomalies crop up in out-of-the-way places and unusual publications. A radio amateur (Dave, K1WHS) noticed that his 432-MHz beam was higher tha normal. Checking his tall antenna, he saw some- thing dangling from the horizontal ele- ments. It turned out to be a good-sized, desiccated catfish. Dave's antenna is 60 feet high and miles from any lake or stream.

(Anonymous; QST, p. 21, February 1998. Cr. L.M. Nash.)

MISCELLANEOUS AND HIGHLY UNLIKELY FALLS

FIBER F AJJ,

March 12, 1993, South Pacific Ocean, aboard the m.v. Alam Selamat.

At 0630, as a frontal system passed the vessel, there was a sudden rain shower lasting about 25 minutes. Captain J.N. Gowrie reported:

As the rain began to dry on the warm decks, we noticed patches of what first looked like slime but after it had dried appeared to be wool or cotton. We send you a sample of the material and the facsímile chart of the relevant surface analysis, showing my additions of ship's position at the time as 41° 43'S, 167° 40'W, course 100°, speed 13 knots.

(Gowrie, J.N.; "Raining--------Sheep?" Marine Observer, 63:199, 1993)

Comment. Incomprehensible as it may seem, there really are falls of slime, jelly- like globs (pwdre ser), and "ángel hair"!

REMARKABLE STRAW FALL

Summer of 1994, Bucks., England

Engineer Ken Davey thought he had stepped into a scene from the Bible when he saw tons of straw falling from the sky.

The 42-year-old, of Holtspur Avenue, Wooburn Green, was leaving Work at Glory Mili Papers, Glory Mili Lañe, on Thursday when he noticed the whole building was covered in straw.

He suddenly realised everyone was staring upwards at objects descending from the sky.

He said: "I looked up and these massive lumps—some as big as bales — were gracefully floating down. It was beautiful.

Mr. Davey estimated as much as ten tons of straw had fallen. The whole of the surrounding area was covered in it.

(Anonymous; "Glory! Glory! Haylelujah," Midweek, Bucks Free Press, July 19, 1994. Cr. A.C.A. Sük.)

Comment. Rarely during haying season, we have seen whirlwinds drape trees and utility wires with wisps of hay— but 10 tons of straw? Never even cióse! However, equ.diy prodigious falls of hay and leaves were occasionally remarked upon in the scientific journals of the last century. See our catalog Tornados, Dark Days.

FALL OF HOT GLOBÜLES

January 6, 1909* Santa Cruz, California.

It rained hot bird shot at Santa Cruz today for nearly an hour, according to Mrs. W.H. Burns and her neighbors. Some of the shot has been preserved.

Mrs. Burns's curiosity was aroused yesterday by the peculiar antics of a number of barefooted children who were playing in front of her house. When she asked them what was the matter they told her that the air was full of electricity and that hot shot was falling from the clouds.

Then she heard a clatter on the house- top like hail and saw little white threads of steam rising from neighbor- ing roofs. The steam was found to be the resuít of the dropping of little hot globules on the damp shingles.

This peculiar rain continued from about 3 to 4 o'clock in the afternoon, and varied in intensity. At one time the children, who were bareheaded and unshod, were compelled to take cover.

(Anonymous; "Hot Shot from the Sky," New York Times, January 7, 1909. Cr. M. Piechota.)

GOBS OF RAW SEWAGE RAIN DOWN ON DTAH

April 9, 1999. Salt Lake Valley, Utah.

Maybe it's a bird, maybe it's a plañe. But it is certainly sewage.

And it's no joke in the Salt Lake Valley, where gobs of thick, raw sewage falling from the sky a dozen times since April 9 have soiled up to seven houses at once.

The smell in the area was "terrible" according to the mayor of Taylorsville. Sheriff's deputies were studying the "splatter pattern" and firemen were hosing down the houses. One house re- quired 500 gallons of water and 30 gal- lons of bleach.

Aircraft landing at the Salt Lake City airport sometimos pass over the afflicted area, but the Federal Aviation Adminis- tration stated----as they always do------ that jet toilet tanks can only be flushed using an external valve. Furthermore, the bluish disinfectant used in aircraft toilets was not present in the sewage samples.

(Anonymous; "Mysterious Sewage from Sky Splattering Utah Houses," Arkansas Democrat-Gazette, May 16, 1999. Cr. L. Farish.)

Comment. The repetition of the phenome- non (a "dozen" times) in the same area is curious. Assuming that aircraft were at fault, was a single plañe responsible, or did a dozen have the same detective valve?

ANOMALOUS PRECIPITATION

A PIECE 'A HE AVEN!

August 1980. Hawley, Pexinsylvania.

On an early summer evening, P.W. Becker, a census taker, was sitting in his car Consulting a map. The car was parked on a dead-end street. No people or other cars were in sight.

> **Suddenly there was a horrific bang and the car rocked. A missile from the sky lay in plain view, square in the center of my car's hood.**
>
> **J cautiously got out to examine the fallen object. Tiny pieces had broken off, but it was largely intact and measured four to five inehes across. I smelled it-------yes, it still carried a faint scent-----of pizza! It was a slice of pizza, solid as a rock and stone coid. This was no ordinary meteorite. I thought of God feeding the Israelites manna from heaven, but God knows I prefer pepperoni. This was plain, tomato and cheese, on a thin crust.**

(Becker, Peter W.; "Manna or Meteorite?" Sky and Telescope, 86:7, August 1993)

Comment, After you stop laughing, recall that many accounts of fish falling from the sky mention that they are frozen. Hummm. Perhaps a whirlwind whipped through a pizzeria! .

PIZZASPERMIA!

We got a good laugh from the above report of the fall of a slice of frozen pizza, but now the phenomenon has suddenly become more serious! At about the same time Sky and Telescope printed the frozen pizza Ítem, Time had a cover story on the origin of life. It was in response to this story that M.D. Greene wrote the following letter to Time:

> **Forget bubbles, comets or ocean vents. Scientists should be looking at pizza for the answer. I can remem- ber when my college roommates and I routinely created life every week in our refrigerator. My theory is that around 4.5 billion years ago, the earth was bombarded by intergalactic pizzas. These then provided the ideal breeding ground in which early organismo could thrive and later evolve.**

(Greene, Mark D.; "How Life Began," Time, 142:8, November 1, 1993)

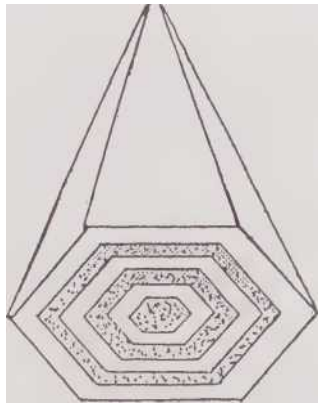
Comment. Charles Fort would certainly have chuckled over the near-simultan- eous mentions of intergalactic pizzas in two diverse publications.

The real bringer of life throughout the universo!

PIRAMIDAL HAIL

Just in case you thought that all hail-stones were roundish, P.S. Vadilo will set you straight below with pyramids- inside-pyramids and thin dises. Many other accounts of highly geometrieal as well as grotesquely irregular hailstones can be found in our catalog Tornados, Dark Days under GWP4.

> **On 20 May 1958 in Leningrad near the Finnish railway station, hail was falling. It lasted only three minutes, but the hailstones were very unusual. They were about 7-10 mm in size, and each hailstone was in the form of a hexagonal pyramid which con- sisted of six pyramids (one inside the other). Three pyramids were of transparent ice, the other three of milk-white ice. (See sketch.) Each milk-white pyramid consisted of sub- individuals (minute hillocks of growth) with air bubbles amongst them.**



Hexagonal-pyramidal hailstones fell at Leningrad in 1958. Concentric layers of olear ice altemated with milky-white (stippled) layers.

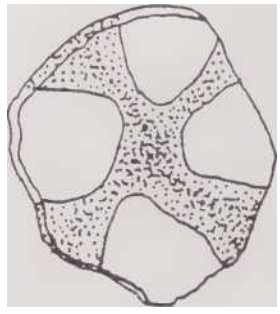
> **On 17 July 1959 in Moscow during a hailstorm lasting several minutes, the hailstones were disc-shaped. Their diameter was 12 mm, and their thickness was 2 mm. They consisted of concentric white and transparent rings.**

(Vadilo, P.S.; "Unusual Hailstones," Journal of Glaciology, 8:327, 1969)

FLAT-PLATE HAIL

May 17, 1993. Berkshire, Bngland.

> **As the coid front passed over Wood-lands St. Mary, west Berkshire (183 meters above sea-level), at 1555 GMT, there commenced a 3-minute duration fall of unusual, flat-plate hailstones, measuring some 12 mm wide by 2 mm thick. These plates were smooth and glassy in appearance (indicating con-ditions of 'wet' growth) but not per-fectly round, taking on an eccentrie, wheel-like structure; with a 'hub' and four-spoke formation of transparent ice, having opaque aireas in between.**



A typical flat-plate hailstone from the May 17, 1993, storm in Berkshire.

(Anonymous; "Flat-Plate Hail----17 May 1993," Weather, 48:433, 1993)

Comment. Other instances of hail píate- lets and small ice sheets may be found under GWP4 in our catalog Tornados, Dark Days. The spoke-like structure mentioned above, however, is most unusual. It is difficult to imagine a meteo- rological procese that could create un- told millions of hailstones — all with this strange geometry.

FALSETTO THUNDER AND TUBULAR HAIL

The following two phenomena were re-ported by N. Baker from South Darenth, Kent, UK. Both occured during thunder-storms during the summer of 2001.

Falsetto thunder. (No specific date)

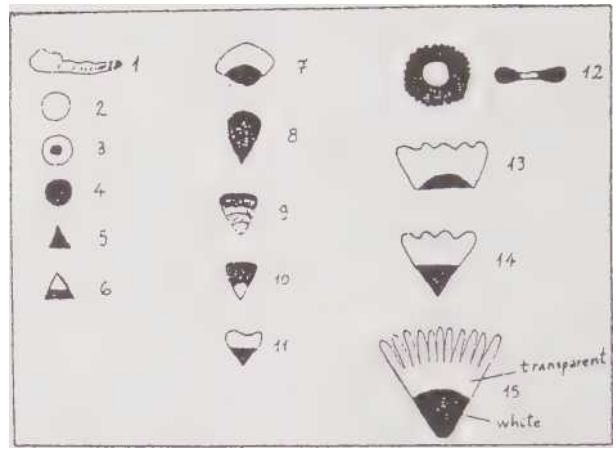
> **Between 2330 and 0000 BST the light-ning and thunder were almost contin-uous and cióse [less than 500 meters distant], causing a local power failure but the strangest occurrence of all carne at about 2350 BST. I can only describe it as a sort of high-pitched (falsetto) thunder, rather like very loud, high-pitched laughter or like an intermittent mechanical saw, lasting about 5 seconds. Thunder rather like loud tearing is not uncommon but this was much higher in tone.**

Tubular hail. (June 26, 20011

At about midnight a ver y violen*- wind carne, gusting to about 20 m s ■*-. There was more lightning. Then I heard the clatter of hail against my window. I looked out at the patio. The hailstones were up to 2 cm in diarneter, but there were also chunks of ice 1 cm x 4 cm, which must have been fragmente of larger stones. Some of the fragments seemed to be hollow tubes.

(Baker, Nick; "'Falsetto* Thunder and Tubular Hail," Weather, 57:231, 2002)

Comment. We have records of tearing sounds of thunder but not the "screech- ing" implied by Baker. Tubular hail is also new to us. Some ice machines make tubular ice shells but how does Nature do it?



Some of the hailstones that fell in the Romanian storm. Of particular interest are the pyramids (5, 6), the dises with transparent centers (12), and the "shuttlecocks" (15).

HAILSTORMS AS IMAGINATIVE SCULPTORS

June 29, 1984. Padis Plateau, Romanía.

This plateau is located in the Transyl- vanian Western Carpathians. The weather was pleasantly warm even though the ground was still covered with snow.

In the south there suddenly appeared a cumulonimbus capillatus whose top seemed to me to be about 14 kilo- metres or 42 000 feet. As the cloud took on the character of cumulonimbus ir as and gradually covered the entire sky, thunder could be heard more and more loudly. The flock of sheep grazing in the deep valley gathered together just as they do before sunset because they too felt th« approaching storm. At 16 UT the first raindrops fell. A weak shower of rain followed, and then loose-struc- tured 20-mm-diameter dises of ice. Soon afterwards what was to be 30 minutes of "sky fire" set in. Stone- like pieces of ice streamed to the ground, very heavily and violently. Some of the hailstones were the size of a nut or plura. Within minutes a wnite carpet covered the plateau of Padis at an altitude of 1200 metres (3900 feet), and the air grew very cool.

The landscape was covered by a miiky-white veil of fog which rose from the coid ground to a height of) to 1.5 metres to embrace the whole dolomite plateau. Then for three minutes the hailstorm paused, before re- starting! It lasted for 55 minutes, and it was in these freezing condi- tions that I began studying and clas- sifying the pieces or balls of ice.

See author's sketches of the remark- ably varied shapes of hail.

(Kosa-Kiss, Attila; "Hailstorm at Padis- Plateau, Romanía," Journal of Meteoro- logy, U.K., 25:96, 2000)

Comment. The perennial question is: What meehanism in a hailstorm generates untold millions of copies of a suite of different, often complex, ice shapes?

REMARKABLE HAILSTONES

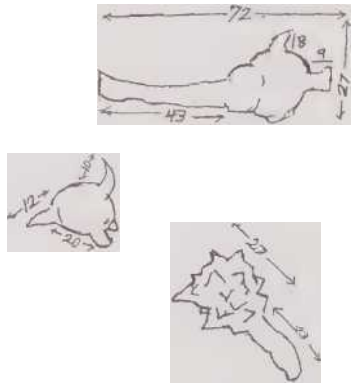
October 16, 1993. Tulsa, Oklahoma.

Circa 5:00 PM, CDT, anomaly wit- ness Keith L. Partain, a trained entomological systematicist, heard a tornado siren. Funnel-like phenomena were reported by local weathercas- ters, one of which approached within one mile of the witness before it lost its vorticity. This was between 5:00- 5:15 PM and parenthesized the interval of anomalous hail. In the target interval numerous hail peppered the area described above. Partain obser- vered shapes which did not conform to spherical and collected several specimens, which he immediately froze.

See accompanying figure for shapes and dimensions.

(Partain, Keith L.; prívate communica- tion, October 17, 1993)

Comment. Often such grotesque hailstones are produced in immense quanti- ties—a meteorological factory of the absurd—and we do not know how this production line operates!



Oddly shaped hailstones from the 1993 Tulsa storm. These weirá shapes were produced by the millions. Dimensions are in millimeters.

KISSES FROM HEAVEN

The Hershey kind, that is. And these hailstones really do resemble this favo- rite candy. There was more than a bag- ful of them; they carne down in a fusi- llade of millions, as related by A. Wills.

During a recent hailstorm in Wales, I was surprised to see that all the hailstones were conical. Each one had an apex angle of about 75°, with a fíat or slightly curved base about 4 millimeters across. What caused this? Is this shape common, and is its simi- larity to an Apollo re-entry capsule coincidental?

A neatly sculpted conical hailstone. It is one of millions just tike it that fell in Wales. Could they have been aero- dynamically shaped while falling?

(Wills, A.; "Hail Capsules," New Scien- tist, p. 121, March 24, 2001)

Comments. Actually, conical hail is more common than you might think. See in our catalog Tornados, Dark Days for many examples. How conical hail forms in such prodigious quantities and in suel geometric perfection in the maelstroms of violent storms is unknown.

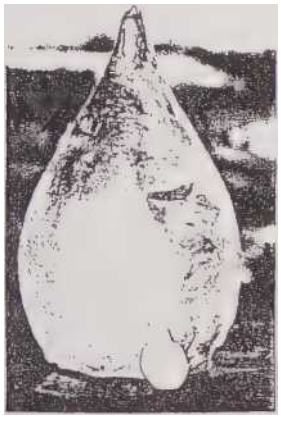
The morphological similarity to the Apollo reentry vehicle is almost certainly coincidental. Droplets of liquid rock that reenter the earth's atmosphere are moldeó into buttons, spheres, and other shapes to create tektites. We do not know of any conical tektites.

TEAR OF THE GODS?

This huge teardrop of ice, weighing four pounde, fell out of the sky and landed on a grasa verge near stunned commuters at a bus stop in Eccles- field, near Sheffield. Firemen took it back to Tankersley fire station and preserved it in a freezer. Later, someone took it out and dropped it.

(Anonymous; "Tears of the Gods," Fortean Times, p. 9, no. 88, August 1996. Source cited: Sheffield Star, March 18, 1996)

Comment. Based on its weight, this "drop" of ice is about 5 inches across. One wonders where in the sky such a large drop of water could form and then freeze solid. The hackneyed ex- planation that ice falls come from leaky aircraft lavatories seems unlikely here!



FOOTBALL-SIZED SNOWFLAKES

Now accepted as fact in the weather records was the report that the Si- berian town of Bratsk in the winter of 1971 got snowflakes as big as foot- balls.

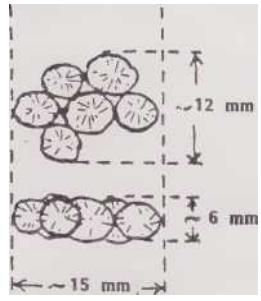
(Anonymous; San Francisco Chronicle, September 25, 1994. Cr. J. Covey)

Comment. Many such reports crop up in the weather journals. Bear in mind that these "giant" snowflakes are really aggregations of thousands of normal- size flakes.

SDPERHAIL

December 24, 1993. North Yorkshire.

Some hall fell in a slight to modérate shower which lasted a couple of min- utes around 0900 GMT on Christmas Eve. The hailstones were roughly spherical in shape, with a diameter of 4 to 8 mm, and translucent, with a faint, crystalline structure radi- ating from their centres. There were also some agglomerates of two or three stones and, unusually, a few contained four to as many as eighi stones in an irregular but planar arrangement, with the larger ones tending towards a hexagonal confor- mation and dimensions of approximate' ly 15 x 12 x 6 mm.



(Cinderey, Mike; "Unusual Hail — 24 December 1993," Weather, 50:194, 1995)

Comment. That snowflakes may agglomer- ate in large pancake-like aggregations was mentioned above, but this is the first time we have heard of hall being welded together in fíat, hexagonal con- figurations. What draws the sepárate hailstones together into the same hexagonal geometry displayed by snowflakes?

STRANGE SNOW SCÜLPTURES

The most familiar snowflakes are those feathery, six-armed dendritic crystals. However, snow sometimes falls as needles and plates. In Tornados, Dark Days, we also catalog three observations of conical snow. These conical forms seem to be aggregates of tapered needles of ice. However, none of the foregoing shapes can surpass in strangeness the "snow- flake" in the accompanying illustration.

Here we see the hexagonal symmetry retained in column form and again in the plates at each end of the icy dumbbell. What those peculiar iceworms pirojecting from the plates are is anyone's guéss.

(Kaiser, Jocelyn; "Snow Up Cióse," Science, 289:503, 2000)

Comment. It is difficult enough to ex- plain the formation of the common six- armed flakes; the worm-terminated dumb- bells are even more puzzling. What sort of mechanism in the atmosphere can scuplt such complex shapes in prodigious quantities?

ICY MINICOMETS

ICY MINICOMETS CAUGHT BY A SATELLITE CAMERA?

A geophysicist really risks his or her reputation if he or she suggests that the earth is bombarded each minute by 20 house-size, icy minicomets. Well, L. Frank, University of Iowa, did just that in 1986. He was duly pilloried for his trouble.

But, at the 1997 spring meeting of the American Geophysical Union, Frank presented new data to back up his pre- vious assertions. The most startling of his new evidence carne from a camera aboard a NASA satellite. Time-lapse photos imaged two objects streaking into the atmosphere over Poland and Germany. Franks identified these as clouds of water molecules from disrupted icy minicomets. The clouds had expanded from the house-size minicomets to clouds 3550 miles wide, weighing 20-40 tons.

Frank thinks the minicomets come from a cloud of such objects orbiting the sun from earth out to Júpiter and beyond. Why don't they evapórate in the sunlight and near-vacuum of outer space? Perhaps, thought Frank, they are protected by a thin coating of carbón. .

(Roylance, Frank D.; "Space Snowballs Theory Gains Credence," Baltimore Sun, May 29, 1997. Also: Monastersky, R.; "Is Earth Pelted by Space Snowballs?" Science News, 151:332, 1997. Thanks to all who sent in clippings. There are too many to mention here. Frank's photos also appeared on some national news programa .)

Comments. We have already mentioned the minicomets several times in Science Frontiers. See vol. 1, p. 275, for ex- ample.

If verified, icy minicomets might well be the source of some of the earth's ocean water. Perhaps they are related to those strange "nebulous" meteors (vol. 1, p. 75) and noctilucent clouds. An intense 40-day minicomet "storm" might be useful in accounting for certain historical floods!!

IT CAN'T BE TRUE BECAUSE IT VIOLATES OUR IDEAS!

This was the collective opinión of many atmospheric scientists when a satellite experiment found approximately 50% more water vapor at an altitude of 75 kilo- ' meters than well-established theory pre- dicted. That was back in 1991. Now, a second satellite experiment of different design has confirmed the existenee of this "excess" water vapor. Most geo-

physicists are perplexed, to say the least.

Not L. Frank, though, because these experimenta are in line with his theory that the upper atmosphere is continuous- ly pelted by house-size, fluffy, icy eomets- -some 20 each minute. (See above.)

Frank asserts:

> When you get that excesa of water vapor up there, it just can't come from the Earth. It muat come from apace.

Even ao, other geophyaieiata are reluctant to accept Frank'a icy cometa— that would be too much "crow" to eat! One point levied againat Frank'a icy cometa ia that they would introduce more than three times the amount of water vapor actually measured. M. Sum- mers, a theoretician at the Naval Research Laboratory, summed up main- stream opinión:

> There'a definitely something very unusual going on in the mesosphere that we don't understand at all, but I'm not even cloae to saying this supports the small-comet hypothesis.

(Kerr, Richard A.; "Rising Damp from Small Comets?" Science, 277:1033, 1997. Also: Monastersky, R.; "Reservoir of Water Hides High above Earth,'[1] Science News, 152:117, 1997)

BROADSIDE AGAINST SMALL ICY COMETS

In a late-1997 issue, Geophysical Research Letters published a group of [*1 2 3]

five papers that detailed five different Jines of evidence that are inconsistent with the claim by L.A. Frank and J.B. Sigwarth that the earth is bombarded ciaily by 30,000 house-size icy comets.
If such bombardment has really been occurring, scientists would have to rethink the origins of the earth's oceans, terrestrial life, and the formation of the solar system. No wonder the icy-comet hypothesis is strongly challenged!

Three of the more interesting points made by this group of papers are as follows:

(1) Our moon could not escape the icy-comet bombardment. Roughly 1,000 craters 50 meters in diameter and splashes of debris 150 meters in diameter must occur each day. There is no evidence that the moon is thus afflicted.

(2) Comets also carry the noble gases argón, krypton, and xenón. These gases should accumulate in the atmosphere as the comets disintegrate. The amounts of these gases actually measured are 10,0 times less than those the postulated bombardment would produce.

(3) The icy comets should break up near the earth and produce clouds of ice crystals. Sunlight reflected from such 30-ton clouds would be brighter than Venus and easily visible before they disperse. Such objects are rarely seen, implying that small icy comets do not exist in the numbers claimed.

Preceding this series of five papers is one by Frank and Sigwarth in which they describe their deteetion of atomic oxygen trails near earth. These they attribute to small icy coméis.

(Various; "Looking for Small Comets— None Found," Geophysical Research Letters, 24:2429++, 1997)

NO HOUSE-SIZED ICY COMETS

Back in 1985, L. Frank saw dark spots on satellite images of the earth's atmosphere. He interpreted them as huge splotches ofwater created by ineoming cometary snowballs (or "icy comets."
(See above digests.) Although some other data supported Frank's theory, many scientists scoffed. After some mildly acrimonious debate, a consensus decided that the spots on the satellite photos were merely instrument artifaets.

Any lingering doubts as to Frank's house-size snowballs or "icy minicomets" impacting our atmosphere have been dispelled by a radar search by S. Knowles and his colleagües at the Naval Research LaboratoTy. Using the Naval Space Surveillance System's powerful radar, their scans of the upper atmosphere detected nothing reserobling giant snowballs. According to Frank's estimates of the flux of ineoming minicomets, the radar should have seen 800-5,000 of them.

If Frank responds, we'll let you know. This may be the end of this decade-long debate.

(Anonymous; "No Snow Show," New Scientist, p. 25, June 12, 1999)

ICY COMETS, OCEANS, LIFE

Our thought, expressed above that the icy-comet controversy might be winding down was premature. P.
Huyghe, coauthor with L. Frank of The Big Splash, responded to the many critiques of the icy-comet theory with three recent articles. Two reply to of the major criticisms of the icy-comet proposal; the third gives geological and geophysical reasons wliy there must have been icy comets or some other substantial influx of water and carbón to the earth's surface down the geological eons.

No instrumental artifaets. The basis for the 1985 claim of L. Frank et al that small, icy comets continually bom- bard the earth's upper atmosphere carne from photos taken far above the earth from the Dynamics Explorer 1. Large, transient "holes" appeared in the atmosphere. These were attributed to vapor clouds created by small, icy comets. (vol. 1, p. 275) Critics claimed that these "holes" were no more than instrumental errors. L.A. Frank and J.B. Sigwarth have investigated this possibility and have rejected it.

(Frank, J.A., and Sigwarth, J.B.; "Atmospheric Holes: Instrumental and Geophysical Effects," Journal of Geophysical Research, 104-.115, 1999. Cr. P. Huyghe)

Navy radar search used incorrect cross sections. A more recent attack on the icy comets carne from S. Knowles et al. They claim that their search of the sky with the Naval Space Command Radar would surely have detected the i'- jomets if they exist. Frank and Sigwarth respond that Knowles et al u£ ;d radar cross sections that are cignificantly different from those typi- cal of icy comets. It is likely that the Navy radar would not have been able to detect the comets.

(Frank, L.A., and Sigwarth, J.B.; "Comment on 'A Search for Small Comets with the Naval Space Command Radar' by S. Knowles et al," Journal of Geophysical Research, 104:22,605, no. A10. Cr. P. Huyghe.)

Knowles et al replied that their radar cross sections were O.K. and their conclusión stands!

Too much water and carbón. Strong, indirect evidence for the steady influx of icy comets comes from the geologists. They find that on and near the surface of the earth there is much more water and carbón than can be ascribed to the weathering of the earth's rocks.
For example, the amount of carbón tied up in rocks (carbonates, etc.) is 600 times that now found in the combined atmosphere, hydrosphere, and bio- sphere. Where did all this extra carbón come from? The same question can be asked about the earth's water inventory.

Geologists have long assumed that this excess water and carbón carne from the outgassing of voléanos. But recent quantitative estimates teU us that the volcanic sources are grossly inadequate. So are all other possible terrestrial sources. Therefore, some scientists, such as D. Deming, University of Okla- homa, have been looking spaceward. Deming ventures that extraterrestrial sources of water and carbón may be four or five orders of magnitude greater than suspected.

Obviously, a steady bombardment of icy comets might fulfill Deming's requirements. Down the long eons of geological time, they could have filled the oceans and showered aH that excess carbón onto the planet's surface.

Deming ups the stakes in the icy- comet controversy when he links these fluffy snowballs to the weU-known vagaries of life on earth.

> The extraterrestrial influx rate may also act as the pacemaker of terrestrial evolution, at times leading to mass extinctions through climatic ■ shifts induced by changes in accre- tion vates with concommitant disrup- tions of the carbón and nitrogen eyeles. Life on earth may be balanced precariously between cosmic pro- cesses which deliver' an intermittent stream of life-sustaining volátiles from the outer solar system or be- yond, and biological and tectonic processes which remove these same volátiles from the atmosphere by sequestering water and carbón in the crust and mantle.

(Deming, David; "On the Possible In- fluence of Extraterrestrial Volátiles on Earth's Climate and the Origin of the Oceans," Palaeo, 146:33, 1999. Cr.
P. Huyghe)

Comment. Need we mention the book Living CometB, by F. Hoyle and C. Wickramasinghe? Why stop at water and carbón? Try bacteria and viruses!

TORNADO PHENOMENA

LOOKING UP INTO A TORNADO FÜNNEL

January 21, 1992. Near Cripple Creek, Colorado. Shortly after 2 PM.

Whlle fishing at Skagway Reservoir, D. McGown spotted an ominous cloud forra a- tion developing in the west. A horizontal, black cloud rolled toward him. Suddenly, it lifted to reveal a huge, twisting funnel advancing directly at him. He threw himself to the ground, but got a good look up into the interior of the funnel.

> **The outside of the tornado was spin- ning so fast my eye couldn't follow it, but the inside was rotating almost lazily. I could see a thousand feet up inside it. Tiny fingers of lightning lined the hollow tube.**

Passing over him, the funnel bounced across the lake, ripped up some trees, and was gone.

(McGown, Dennis; "Letters," Time, 147: 8, June 10, 1996)

Comment. The "tiny fingers of lightning" are of great interest to anomalists, be- cause most meteorologists deny that electricity plays any part in tornado activity. Of course, there is often plenty of ordinary lightning in the accompany- ing storms. An observation very similar to McGown's occurred in Kansas, in 1928. (See Remarkable Luminous Phenomena for more.)

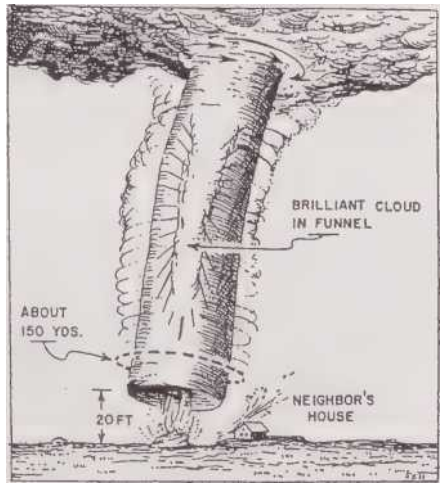
Today, American meteorologieal journals are mostly filled with articles on the computer-modelling of weather Systems, satellite-imaging, etc. Eyewitness accounts of unusual phenomena were common 100 years ago in the Science journals. Now, we have to get them from Time!

POSSIBLE NOCTURNAL TORNADO LIT UP BY ELECTRIC AL DISCHARGES

January 10, 1994. Farnham, Surrey, UK. At 0448 GMT, followlng a sudden cessa- tion of rainfall,

M.D. Smith beeame aware of an orange glow outside his window. Accompanying it was a roar like that of a military jet. The phenomenon occurred a total of four times; the second of which is the more interesting.

> **A Becond illumination was observed twenty seconds later, but this time it reappeared away from the tree so a clear view was possible. The illumi- nation was in the form of a narrow column and of the classic gentle 'S' tornado shape in the 'roping out' stage; it was silvery in colour to- wards the top and golden-orange lower down. Additionally, Mr. Smith saw the illumination move from the sky towards the ground, but at a speed slower than lightning. The sound of rushing wind was heard again, while this illumination lasted five to six seconds. Mr. Smith also noted a very low cloud base with a second layer of cloud only slightly higher.**



Very rarely the funnel of a nocturnal tornado will glow like a neón light, suggesting internal electrical activity.

(Reynolds, David J.; "Nocturnal Tornado Illuminated by an Electrical Discharge at Farnham, Surrey, 10 January 1994," Journal of Meteorology, UK, 20:381, 1995)

Comment. Although ordinary lightning aceompanies many tornados, glowing columna suggestive of other types of electrical discharge are not part of pre- vailing tornado theory. Nevertheless, observations of glowing discharges with- in the funnel—making it look like a neón light----have been observed and even photographed. See above sketch taken from GLD10 in our catalog Re- markable Luminous Phenomena.

WEIRD WATERSPOUT?

Spring 1934, North Pacific. Aboard the freighter Cape Horn enroute to Singa- pore with a cargo of sawn lumber.

G. Craig was the helmsman on the Cape Horn during a powerful. storm (winds of Forcé 9-10, seas running 8 meters high). Even at 4 A.M., the phos- phorescence of the breaking sea made it seem like daylight.

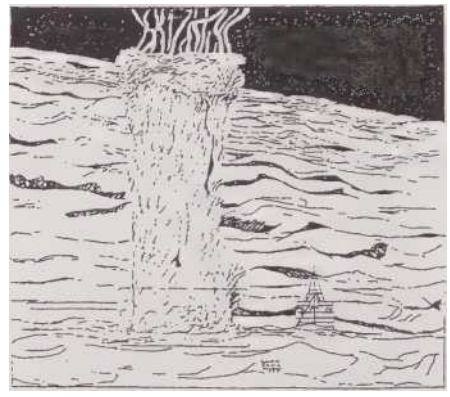
At 4:30, Craig saw what he thought was a colossal wave forming. It was so large that the vessel seemed certain to capsize. He thought he was a goner. But, strangely, the "wave" closed with the vessel very slowly and seemed to move independently of the rest of the stormy sea. Craig recalled other strange features of the phenomenon:

> **...what I had initially mistaken for wave crests were actually widely-spaced 'geysers', dancing on the up- per surface and each rising to a height of about 20 feet, dropping to half of it, then rising again. [See Craig's sketch.]**

Then, suddenly, when all seemed lost, the wind dropped from a full gale to an eerie calm. The "wave" passed—genfly — and then the storm resumed.

The Cape Horn was drenched, but there had been no shattering of glass ñor rending of wood. There was some flooding but no more than usual in very heavy seas. Some of the lumber lashed to the deck had been lost, but, over all, damage was minimal. The seemingly cata- stropic "wave," topped by the peculiar geysers turned out to be only a hollow threat, and the "wave's" hollowness may be a clue to its true nature.

(Craig, Gavin; "Surviving a Giant Sea— Did the Ship Strike a Waterspout?" Journal of Meteorology, U.K., 25:241, 2000)



G. Craig's sketch of the ominous "wave" topped by "geysers." The encounter was not as catastrophic as Craig had expected.

Comment. Indeed, hollowness is char- acteristic of a waterspout. They are fierce on the outside but calm inside. A trip through a genuine waterspout, as described in vol. 1, p. 263, yielded a similar account of impending catastrophe but in the end only a gentle passage. The Cape Horn had apparently been hit dead on by a waterspout.

But the strange geysers atop the 'wave' or spout deserve an explanation that we cannot provide.

WEATHER MISCELLANY

EARTBQUAKE WEATHER

Folklore reserves the term "eart.hqu&ke weather" for the sultry, ominously un- easy perlod said to precede lar ge earth- quakes. Scientists have generally be- littled suggestions that weather could have anything to do with the ponderous torces unleashed during a quake. Despite such authoritative pronouncements, rr.any Californians, who have ampie ex- perience with seismic events, insist that quakes and weather are somehow con- nected.

They may be right-----at least some of the time. In the five years foliowing the 7.3 Landers earthquake o£ June 28, 1992, the frequency of smaller quakes has peaked reliably every September. However, before the Landers event, no such pattern is evident.

One thought is that the average atmo- spherie pressure, which is lower in the summer months, reduces the downward" pressure on the earth's crust enough to allow easier slippage along fault lines. This sounds reasonable, but why did this effect not occur before the Landers quake? The answer given is that perhaps the Landers event "sensitized" nearby faults!

(Monastersky, R.; "California Shakes Most Often in September," Science News, 152:373, 1997)

HOW CAN THE MOON AFFECT THE EARTH'S TEMPERATDRE?

Several weather phenomena, such as precipitation and thunderstorm frequency, have been linked to the phase of the moon. Now, it seems that the moon's "coid" emanations can also raise the earth's temperature. Explaining how the moon's phase can have any warming effect at all on the earth's atmosphere is difficult, because. the infrared energy received from the moon is only 10 “"that in sunlight. Nevertheless, a slight but statistically significant temperature effect does exist.

In one study, the microwave emission of molecular oxygen was measured by a polar-orbit satellite. These data gave meteorologists the temperatures of the lowest 6 kilometers of the atmosphere from all areas of the planet. The temperature difference between full moon and new moon was only 0.02°C, with the full- moon temperature being the higher. (Ref. 1)

A second study took actual surface temperatures measured at noon GMT each day at 51,200 locations around the World. These near-surface temperatures revealed a difference of 0.2°C between full and new moons—ten times larger than that from the satellite study. (Ref. 2)

0. 2°C and even 0.02°C are much too large to be attributed to direct lunar "heating." Instead, geophysicists wonder if the moon's orbit modulates the influx of meteorie dust which may affect solar heating of the earth by absorption.

(Ref. 1. Balling, Robert C., Jr., and Cerveny, Randall S.; "Influence of Lunar Phase on Daily Global Tempera- tures," Science, 267:1481, 1995. Ref. 2. Gribbin, John; "A Mysterious Monthly Temperature Cycle," New Scientist, p. 18, January 28, 1995)

MOONLIGHT WAXES HOT AND COLD

Abroad at night, one feels no warmth from the full moon and certainly no chilling effect. Well, one shouldn't, ex- cept perhaps due to psychological effects, for the measured effect of the full moon on air temperature is only a fraction of a degree. Specifically, Arctic and Antarc- tic temperatures are only 0.55°C higher at full moon than at new moon. Not much!

The scientific puzzles are: (1) Why is there any effect at all, given the fact that moonlight is only highly attenuated reflected sunlight; and (2) Why does the full moon heat the polar regions and, contrary-wise cool the mid-latitudes? At the same time, no effect at all is seen in tropical temperature measurements. Obvi- ously, it cannot be a question of the direct lunar rays.

The data supporting the moon's miniscule thermal and refrigerating effects come from satellite instruments.
The claimed phenomenon just might be an artifact of these satellite temperature sensors. Then again, the moon's tidal effect on the earth's atmosphere may be the culprit. No one yet claims to under- stand what is going on; that is, heating at the poles, cooling at mid-latitudes, and zilch in the tropics.

(Monastersky, R.; "Earth's Poles Feel Warmth of the Full Moon," Science News, 151:22, 1997. Also: Pearce, Fred; "A Full Moon Warms ley Wastes," New Scientist, p. 15, January 11, 1997.)

STYTHE?

Has anyone heard of "stythes" before? They seem ominous!

> Donald Tollett, 60, died from suffoca- tion after a freak weather phenomenon called a stythe caused a drop in air pressure, sucking carbón dioxide from a disused coal mine. He was walking through the Karva Woodcrafts factory unit in Widdrington Station, North- umberland, on 11 February, on his way to feed his neice's horse, accom- panied by a family friend, David Wind, 8, and a pet dog when he and the collie were overeóme.

(Anonymous; "Strange Deaths," Fortean Times, no. 82, p. 20, August-Septem- ber 1995. Sources cited: London Times and the Daily Telegraph.)

STYTHE = CHORE DAMP

This, according to an unabridged dio- tionary. Looking up "choke damp", it is found to be "a suffocating gas, chief-]y carbón dioxide, found in wells, coal miues, and other pits, also caHed "black- damp."

Evidently, in the above quotation doscribing the death of one Donald Tol- lett due to a stythe, the word "stythe" was used for the meteorological event it- self rather than-----correctly-----for the gases sucked out of the coal mine by a sudden drop in atmospheric pressure.

(Stepp, Richard; personal eommunication, November 26, 1995)

Comment. Changes in atmospheric pressure are also the causes of "blowing caves" and "weather wells". See GHG2 in Earthquakes, Tides.

Incidentally, blowing caves were used in the very early days of aernonautics for testing aircraft models due to the lack of wind tunnels.

PÜZZLING WINDS

The Amazon jungle seems to be receiving more than its share of natural calamities. Remember the meteor-devastated swaths and strange "cráter" reported in on p. 176. Well, here's another phenomenon that may or may not be related.

> Scientists studying weather patterns in the Amazon Basin have detected extremely powerful, sudden bursts of wind over the rainforest. The winds, which appear to be associated with thunderstorms in the northwest part of Brazil, blow downward with tremendous forcé. Satellite photos indícate that a single episode demo- lished 10 square miles of jungle in only 20 minutes.

(Anonymous; INFO Journal, no. 74, p. 39, Winter 1996. Source cited: Alexandria (VA) Journal, June 30, 1995)

ROCK-FALL AIR BLASTS

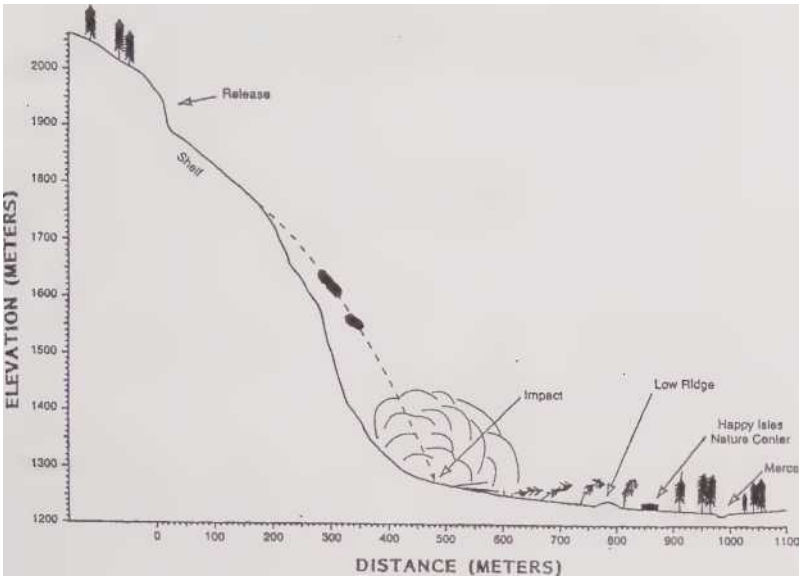
It is well known that snow avalanches act like pistons and push blasts of air at hurricane speeds ahead of the deluge of snow. An unusual rock fall at Yosem- ite created a similar air blast with severe consequences.

July 10, 1996. Yosemite National Park, California.

We reported this remarkable event on p. 258 for its far-flung seismic waves, which jostled seismographs at Berkeley and Reno over 200 kilometers distant.

Actually, there were two rock falls 14 seconds apart. The "rocks" fell from a 665-meter cliff at Happy Isles in the eastern part of Yosemite VaHey. No pebbles these; with volumes of 23,000 and 38,000 cubic meters.

> Although the impact area of the rock falls was not particularly large, the falls generated an air blast and an abrasive sandy cloud that devastated a larger area downslope of the impact



sites toward the Happy Isle§ -Nature Center. Immediately downslope of the impacts, the air blast had velocities exceeding 110 m/s [about 245 mph] and toppled or snapped about 1000 trees. Even at distances of 0.5 km from impact, wind velociies snapped or toppled large trees, causing one fatality and several serious injuries beyond the Happy Isles Nature Center. A dense sandy cloud trailed the air blast and abraded fallen trunks and trees left standing.

(Wieczorek, Gerald F. et al; "Unusual July 10, 1996, Rock Fall at Happy Isles, Yosemite National Park," Geological Soci- ety of America, Bulletin, 112:75, 2000)

JUST PLAÑE WEIRD

T. Surendonk has written to New Scien- tist how he and a friend would stop on Sepulveda Boulevard, at the edge of the Los Angeles airport, to watch the big jets come in directly overhead for a landing.

> While the huge planes were impressive enough, our attention was eaptured by an event that sometimes occurred between twenty and thirty seconds after a plañe had flown over: a thin tube of misty air would zap past us at apparently high speed accompamed by a rather loud flapping sound.
>
> Sometimes the "mist" would follow a straight path, but often it would follow a really contorted path that made the "mist" look like a snake engaged in a rather violent path------- rather captivating to watch.
>
> We suspected that the effect was some sort of remnant of the vapour trails that sometimes carne off the tips of the wings and tried to con- fírm this by direct observation, but we could never keep track of such a trail for more than 5 seconds. Also, we were never totally convinced that the two effeets were correlated. Any- way, wouldn't such a trail dissipate within a few seconds?

(Surendonk, Timothy; "Just Plañe Weird," New Scientist. p. 58, March 5, 1994)

Comment. If these "mists" are merely trailing vórtices, the long time delay between passage of the plañe and the tube of mist is puzzling.

PLAÑE WEIRDNESS MADE PLAIN

Above, under the title: "Just Plañe Weird," we questioned the long-term persistence of trailing vórtices from air- eraft wingtips. Could such vórtices actu- ally maintain their integrities for several minutes and thus produce the curious tubes of misty air and flapping sounds observed at the end of the Los Angeles airport runway? The answer seems to be YES, as confirmed below:

> Wingtip vórtices have a core diameter of 20 to 40 feet and, as they trail behind each wingtip, remain approxi- mately two wingspans apart. Why ^ don't they enlarge in radius and dissipate? The rapid acceleration at the outer edge of the vortex produces low pressure in the core, and this pressure differential creates enough centrifugal forcé to hold the system tightly together for three to seven minutes. After that, friction takes its course, breaking these stubborn twisters apart into mere turbulenee.
>
> The rest of this article deais with how light aircraft can avoid these sometimes deadly horizontal "twisterB."

(Manningham, Micah D.; "Wake Turbu- lence," Prívate Pilot, p. 69, June 1994. Cr. W.A. Welch)

THE PULSE BEAT OF THUNDERSTORM ACTIVITY

Thunderstorms are not always erratic, isolated atmospheric disturbances. Visual observations of thunderstorra systems, eoupled with data from radars and radio- noise detectors reveal that the electrical activity in these storms waxes and wanes with an average period of about 30 minutes. Since such sustained oscil- lations require a feedback mechanism, it seems that thunderstorm systems are eomplex, tightly organized entities span- ning large oreas. Atmospheric scientists are trying to unravel the factors that give thunderstorms systems this "heart- beat."

(Satyam, M.; "Cyclic Variation of the Rate of Flashing in Thunderstorms," Journal of Atmospheric Sciences, 19: 346, 1962)

Crc-ss reference In vol. 1, p. 263, we introduced thunderstorm "clusters" that stretched for 1,000 miles.

THE PESHTIGO HORROR

October 8, 1871, was the date of two immense North American conflagrations: the Great Chicago Fire and the Pesh- tigo Horror, the latter a firestorm that incinerated some 2,400 square miles of Wisconsin and over 1,000 human beings. The summer of 1871 had been tinder- dry in the upper Midwest, so fires were not surprising; but two colossal fires on the same day? "Just eoincidence" is mainstream thought, but others opt for ignition by a comet or perhaps some electrical phenomenon. (See, for ex- ample M. Waskin's book Mrs. O'Leary's Comet (1985)).

We also have at hand a 26-page eye- witness account of the inferno that swept over the sraall town of Peshtigo and surrounding areas. Three phenomena recounted therein are of interest to anomalists.

> Many circumstances tended to prove that the intensity of the heat pro- duced by the fire was in some places extreme, nay unheard of. I have al- ready mentioned that the flames pur- sued the roots of trees into the very depths of the earth, consuming them to the last inch. I plunged my cañe down into these cavities, and convinced myself that nothing had staved the course of combustión save the utter want of anything to feed on. Hogsheads of nails were found en- tirely melted though lying outside the direct path of the flames.
>
> Strange to say there were many corpses found, bearing about them no traces of scars or burns, and yet in the pockets of their habiliments, equally uninjured, watches, cents, and other articles in metal were dis- covered completely melted.
>
> When the hurricane burst upon us, many, surprised and terrified, ran out to see what was the matter. A number of these persona assert that they then witnessed a phenomenon which may be classed as marvelous

> **Thay saw a Icrgc blaek object, re-F.rmbling a balloon, which object revolved in the air with great rapidity, advancing above the summits of the trees towards a house which it seemed to single out for destruction. Barely had it touched the latter when the balloon burst with a loud report, like that of a bombshell, and, at the same moment, rivulets of fire streamed out in all directions.**

(Pernin, Peterj "The Great Peshtigo Fire: An Eyewitness Account," Wisconsin Magazine of History, 54:246, 1971)

Comments. The preferential melting of

metal objects is one of the "pranks" of lightning. The large black "balloon" could have been a fire tornado, a phe- romenon sometimes seen in forest fires.

Cross reference. The Peshtigo firestorm is also met with on p. 205.

HYDROLOGICAL PHENOMENA

WAVES

ROGUE WAVES

A HÜGE ROGUE WAVE

Skcptical scientIsts aren't betting on the aceuracy of a buoy that measured a rogue wave off the coast of nor- thern Vancouver Island at 30.3 metres [99.4 feet].

During a strong storm last Friday,' a meteorological buoy 100 küometres west of Cape Scott tumbled off the erest of a wave and into the trough, measuring the wave at 30.3 metres.

(McCulloch, Sandra; "Scientists Wary as Buoy Measures Huge Rogue Wave," Victoria (BC) Times-Colonist, December 16, 1993. Cr. B. Chapman.)-

Comment. In February 1933, the USS Ramapo encountered a wave estimated at 112 feet high. See GHW1 in our eata- log Earthquakes, Tides.

THE SHIP-SWALLOWERS

It's happened hundreds of times, and thousands of sailors have lost their Uves. The kiUers are giant, usuaUy soUtary, waves that seem to come out of nowhere. These monster walls of water appear in seas that are rough but not fearfuUy so. Suddenly, a ship will find itself in a deep trough. Then comes a wall of water, 50-100 feet high. (34 meters is the biggest reliable measurement.) The ves sel is flooded, perhaps its back is broken.
It sinks like a rock without even sending a distress signal. Another ship has been devoured by a rogue wave.

Just between 1969 and 1994, 60 supercarriers were lost due to sudden flooding. Of this number, 22 were apparently swaUowed by rogue waves.

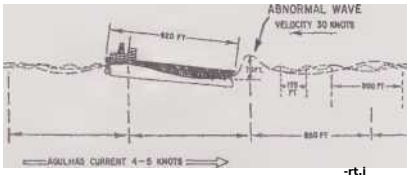
The rogue waves appear unexpectedly. They dwarf all surrounding waves. For a long time, the rogues were said to be just chance additions of two smaller waves. But they are too big and occur too frequently to be statistical flukes.
In addition, statisticians have trouble in accounting for the fabled and feared "three sisters"—three massive waves in succession.

Consequently, scientists have re- treated to a now-familiar refuge: non- Unear effects. They show mathematicaUy how small perturbations in a physical system can lead to huge consequences— on paper at least.

(Lawton, Graham; "Monsters of the Deep," New Scientist, p. 28, June 30, 2001)

Comments. Somehow, as insinuated above, blaming monstrous waves on non-Unear effects is not very satisfying in our world that likes clear-cut cause-and- effect.

Twenty-two huge vessels swaUowed up by giant waves! Yet, we never see notices of such events in the papers!
A smaU tanker oil spill gets much more media attention. Why the lack of media attention?



-rt.i

Giant solitary waves are usuálly preceded by deep troughs, as seen in this sketch of a vessel in the notorious Aghulas Current off the coast of South Africa. (From: our catalog Earthquakes, Tides.)

ROGUE WAVE SMASHES THE QUEBN BLIZABETH II

September 11, 1995. North Atlantic. Aboard the Queen EUzabeth II enroute from Cbierbourg to New York.

During this Crossing of the Atlantic, the Queen EUzabeth II had to change course to avoid Hurricane Luis. Despite this precaution, the vessel encountered seas of 18 meters with occasional higher crests. At 0400 the Grand Lounge Windows, 22 meters above the water, stove in. But this was only a precursor.

At 0410 the rogue wave was sighted right ahead, looming out of the darkness from 220°, it looked as though the ship was heading straight for the white cUffs of Dover. The wave seem- ed to take ages to arrive but it was probably less than a minute before it broke with tremendous forcé over the bow. An incredible shudder went through the ship, followed a few minutes later by two smaUer shud- ders. There seemed to be two waves in succession as the ship feU into the 'hole[1] behind the first one. The second wave of 28-29 m (period 13 seconds), whilst breaking, crashed over the foredeck, carrying away the forward whistle mast.

Captain Warwick admits that some- times it can be difficult to gauge the height of a wave, but in this case the crest was more or less level with the Une of sight for those on the bridge, about 29 m above the surface; additionaüy, the offícers on the bridge confirmed that it was definitely not a sweU wave. The presence of extreme waves was also recorded by Canadian weather buoys moored in the area, and the máximum measured height from buoy 44141 was 30 m (98 feet.)

The Queen EUzabeth II survived the onslaught with minor damage; no passengers or crew members were injured.

(Warwick, R.W., et al; "Hurricane 'Luis', the Queen EUzabeth 2 and a Rogue Wave," Marine Observer, 66:134, 1996)

Comments. Even though these so-caUed "rogue waves" sometimes appear under calm conditions, the stock explanation for them involves the chance addition of two smaller waves from intersecting wave trains.

Recently, B. Fornberg and B.S. White have taken a different tack:

Using a mathématical model, they demónstrate that ocean currents or large ñelds of random eddies and vórtices can sporadicaUy concéntrate a steady ocean sweU to create unusu- aUy large waves. The current or eddy field acts Uke an optical lens to fo- cus the wave action..."

Maybe BO, but this article admits at the outset that soütary rogue waves may occur in calm seas.

(Peterson, I.; "Rough Math: Focussing on Rogue Waves at Sea," Science News, 150:325, 1996)

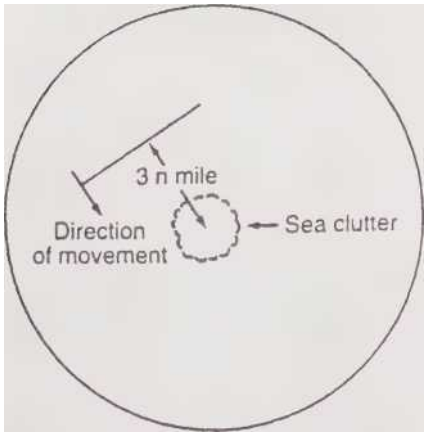
UNUSUAL WAVE PHENOMENA

UNUSUAL WAVE

January 14, 1998, Indian Ocean. Aboard the m.v. Oriental Bay, enroute Port Klang to Suez.

At 2230 UTC the vessel was on a course of 269° at 23 knots when a Une was observed on the radar at a range of 3 n müe, travelüng from northwest to southeast at an estimated speed of 15 knots, as indicated on the sketch. The Une was observed to be a wave.

It was about 10 minutes after the first sighting that the vessel passed over the wave, which was approximately 4 m [13 feet] high, and she heeled 5° to port while the autopilot deviated 3° off course. At the time of the event, there was a low sweU of 1.0 m from 320° and the sea was 0.5 m from 360°. The current was estimated to be 2.5 knots running to the west.



Sketch of the radarscope on the Oriental Bay showíng the unusual wave.

as if from a singular, íarge swell wave running along a line bearing approximately 290°-110° and moving towards the ship in a south-south-westerly direction, see sketch. Al- though it was night-time, it was light enough to determine visually at a distance of about 1 n.mile, that it was not a large swell wave. At 1947 the vessel was passing through the echo which extended out to 4 n.mile on either side of it and, on observing the water around the ship with the aid of an Aldis lamp, it was noted that there was a great deal of turbu- lence present. The Enterprise, fully laden with iron ore, suddenly veered 6° to port of her heading of 325°, indicating the strength of the turbu- lence. The sea prior to this point was only slightly rippled by a light SW'ly wind, forcé 1-2. The band of turbulence was approximately 20 m wide and the sea beyond it was once again only slightly rippled.

(Harris, P.C.; "Radar Echo," Marine Observer, 63:111, 1993)

It tlierefore seems clear that some- thing unusual is going on in the North Atlantic. One would suspect increased winds, but velocities measured at Seven Stone have remained constant while wave heights rose. It is concluded that the bigger waves are not generated by local winds; rather, they are swells that have been created thousands of miles away. The cause of these larger swells now affecting the entire North Atlantic is not known. The authors of this paper are forced to conclude with:

> It should be noted that so far it has not been possible to attribute the observed change to either an anthro- pogenic cause or to natural elimate variability on decadal time scales.

(Bouws, E., et al; "The Increasing Wave Height in the North Atlantic Ocean," American Meteorological Society, Bulletin, 77:2275, 1996)

(Talbot, A.P.; "Unusual Wave," Marine^ ' Obsei *;ei*, 69:10, 1999)

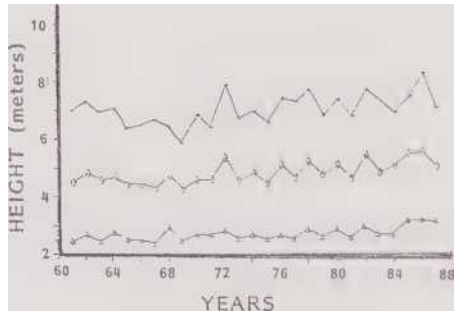
Comment. The wave could not have been a tsunami beeause it was travelling too slowly. Tsunamis travel at jet speed and are rarely visible on the deep ocean.
Since the wave was solitary and four times the height of the gentle swells, it is unlikely that it was a chance combina- tion of the swells. Most likely it was a surface manifestation of an internal wave that had been reflected from an undersea obstacle like the continental shelf.

ATLANTIC WAVE HEIGHTS INCREASING

We have touched on this subject before. (vol. 1, p. 279) We now have more precise data.

Wave-height measurements at the Seven Stone Light Vessel, anchored in the northeastern Atlantic, show that wave heights have increased 2.4 centi- meters/year during the period 1960-1985. This is not a trivial amount. At this rate, waves a century from now would be 2.4 meters (about 8 feet) higher. Many ex- isting coastal struetures will be smashed to bits. All this is over and above any effects from rising sea levels.

The records from the Seven Stone Light Vessel are corroborated by an analysis of more then 20,000 wave charts of the North Atlantic drawn between 1960 and 1988.



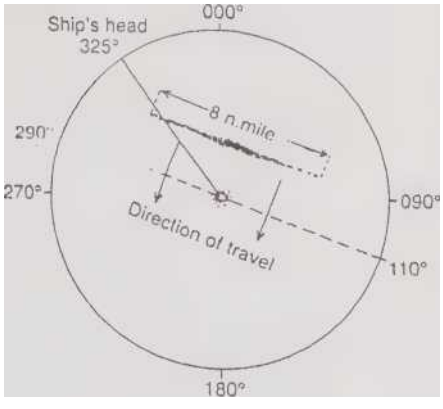
Atlantic wave heights, 1960-1988. From the top: 1, 10, SO percentiles.

BAND OF TURBULENCE

That the ocean deeps also have their "weather" is evident in the following report. While reading it, be aware that it is only the surface manifestation of larger phenomenon which, like the bulk of an iceberg, is concealed from the observer.

July 29, 1992. Equatorial Atlantic. Aboard the m.v. Enterprise enroute from Saldanha Bay to Las Palmas.

> **At 1930 UTC a bold linear echo was suddenly noted on the radar screen,**



Sketch of the Enterprise radarscope showing the band of turbulence.

SEICHES AND DEATH WAVES

SEASHORE SEICHES

At many spots around the world, sea- level rises and falls with periods of only a few minutes-----much shorter íhan the common semidiurnal tides and much longer than wind-generated waves.
These oscillations of the water surface are termed "seiches." Two fundamentally different kinds of seiches have been noted in the recent literature. The first variety is transitory and can be set into motion by weather disturbances and earthquakes. The second is permanent and a bit more mysterious. Let's take transitory seiches first

September 17, 1992. Anglesey, England. At about 0700 in the morning:

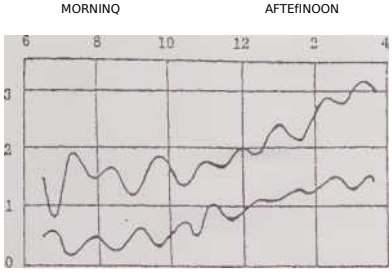
> **I was on the beach at Trearddur on western Anglesey, when an acquain- tance drove down the beach towing a físhing boat. He launched the boat in about six inches of water and we then engaged in conversation for a couple of minutes. Turning to the boat, we were amazed to find that it was high and dry about 20 metres from the water's edge. Small flatfish, mainly immature brill, could be seen stranded and ñapping in the wet sand. About a minute later, the sea started to return and quickly rose up the beach beyond where the boat had originally been launched. An hour later, the oscillation in sea level was still taking place. I determined that the period was just over three minutes and the amplitude just under one metre, the latter measured with reference to a half-submerged rock.**
> **At the time of the event, it was just after low water, there were no wind waves or ground swell, and the sea had a glassy appearance.**

(Kemp, A.K.; "Anglesey Seiche," Marine Observer, 63: 90, 1993)

Permanent feature. Puerto Princesa, Palawan, the Philippines.

The basic phenomenon impinging on this coast was described by F.J. Haight back in the 1920s. Haight plotted the sea oscillation in the aecompanying graph. Recent studies of the Puerto Princesa seiches show that the amplitudes of the seiches are greatest every two weeks, indicating they are tied in some way to the astronomical tides. However, they lag the lunar tide by a couple of days. Geophysicists now look to Pearl Bank in the Sulu Sea, some 450 kilometers south- east of Puerto Princesa, where they be- lieve tidal currents create "internal waves" as they hit the shallow bank. These internal waves travel beneath the ocean surface at speeds of only about 8 kilometers/hour, taking about 2} days to reach Puerto Princesa. Here, they surge against the land, causing the observed seiches.

(Giese, Graham S., and Chapman, David C.; "Coastal Seiches," Oceanus, 36:38, Spring 1993)



Short-period oscillations in the tidal records at Puerto Princesa, Palawan, in the Philippines.

DEATH WAVES AND SEEBARS

A comprehensive, 12-page article on seiches appeared in the July/August issue of American Scientist, and it was awash with eurious observations. A seiche (pronounced "saysh") is a rhyth- mic rocking motion of a body of water that has been disturbed by natural forces, such as sudden weather changes and, especially, earthquakes.

A famous example of the latter seiche-driving forcé occurred on March 27, 1964, when the Great Alaskan Earth- quake sent seismic waves rippling around the globe. Fourteen minutes after this quake, the tremors reached the U.S. Gulf coast and triggered numer- ous seiches in bays, harbors, canals, bayous, etc. Some crest-to-trough water-level oscillations reached 2 meters in amplitude. Startling though these seiches were to Gulf fishermen, most seiches are well-explained. B odies of water that are mostly enclosed have natural frequencies of oscillation or "sloshing," just as do coffee cups and bathtubs. The Alaskan quake just opera- ted on a larger scale than a bump to your coffee cup!

So far, so good. But there are exista an interesting—and sometimes dan-gerous----class of related events that affects open coastal waters. The Irish cali them "death waves." In the Baltic, they are "seebars;" in the Azores, "lava-diads." Whatever their ñame, they are large, tsunami-like waves that suddenly enter coastal waters and which cannot be assigned to any known triggering forcé. The frequency of occurrence of these "coastal seiches" may be a clue to their source. For example, off the Puerto Rican island of Magueyes, coastal seiches are most common about 7 days after new and full moons, Buggesting a tidal influence. Oeeanographers G.S. Giese and R.B. Hollander think that these coastal seiches are the consequence of internal waves (or "solitons") formed at the southeastern edge of the Carib- bean where tidal effects are particularly powerful 2 days after new and full moons. These slow-moving internal waves take 5 days to reach Puerto Rico, where they emerge as coastal seiches. Similar internal waves created by tidal currents at the edges of the continental shelves and deep-water sills may explain the mysterious coastal seiches recorded in the Anadaman and Sulu Seas. (vol. 1, p. 280) So far, no one has suggested origins for the Irish "death waves" and the Baltic "seebars."

(Korgen, Ben J.; "Seiches," American Scientist, 83:330, 1995)

Comments. Internal waves or solitons move, mostly unseen at the surface, along the ocean's thermocline—the plañe separating warm surface water from much colder water below. The vertical amplitude of the solitons may be hundreds of meters, but at the surface they are represented by only small, gently domed, slowly moving waves or by regions of turbulence. Coastal seiches appear when the solitons impinge on coasts.

90-DAY SEA-LEVEL OSCILLATION AT WAKE ISLAND

Most North Americans are familiar with rather powerful diurnal tides. The oceans, however, also move in ponderous cycles that beaehcombers can never appreciate. Thanks to data from Geosat's precisión altimeter, geophysicists can now discern some of these long-period moving patterns on the oceans' surfaces.

Energetic 90-day oscillations of sea levels have been intermittently ob-served at Wake Island in the western tropical Pacific during the past 2 decades. The oscillations tend to oc-cur about 1.5 years after El Niño-Southern Oscillation events, to have amplitudes of 10-15 cm, and to per-sist for about 1 year. Sea-surface heights from the Geosat altimeter are used to establish that these signáis take the form of Rossby waves and have an energy source near the Big Island of Hawaii, which lies 40° of longitude to the east. Sea-level and upper-layer currents from an eddy-resolving numerical model are ex-amined and suggest that the energy source is eddies generated off the Big Island of Hawaii. These eddies appear to be associated with westward currents that intermittently impinge on the island.

(Mitchum, Gary T.; "The Source of 90- Day Oscillations at Wake Island," Jour- nal of Geophysical Research, 100:2459, 1995)

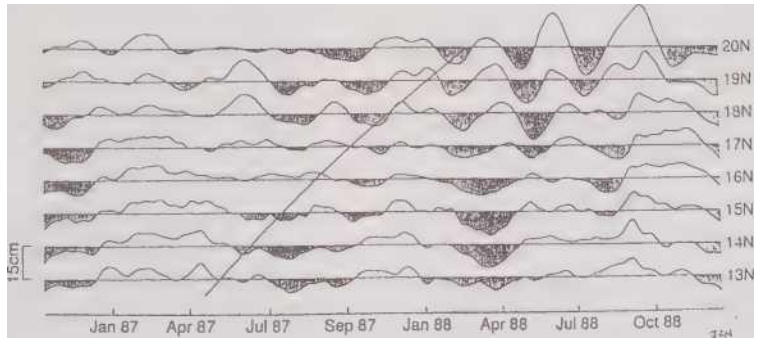
Comment. Such eddies would have to persist for long periods to survive the long trip to Wake Island some 2500 miles away. In this, they must be like the current rings that break off from the Gulf Stream in the Atlantic.

LAKE CHAMPLAIN'S TWO SEICHES

The main body of Lake Champlain is 117 kilometers long, with an average breadth of 6.3 kilometers, and average depth of 29 meters. Although its shoreline in com- plex, there is a deep channel about 2 kilometers wide with steep sides running lengthwise along the lake floor.

When wind blows across the lake's surface, wind-drag pushes surface water downwind. When the wind stops or changes direction, the piled-up water is freed, and standing waves are set up as the water sloshes back and forth in the lake basin. These waves are called "seiches." Lakes usually have character- istic periods of oscillation. For Lake Champlain, it is 4 hours, with amplitudes measured only in centimeters on the sur- face of the water.

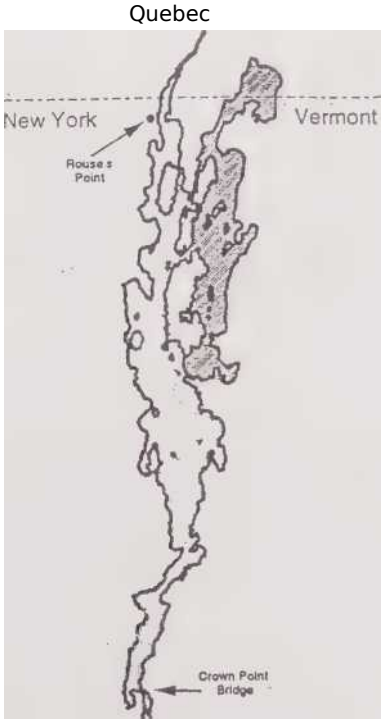
What makes Lake Champlain of more than usual interest is the presence of a second seiche, an internal phenomenon not visible on the surface. In the sum- mer, Lake Champlain is stratified with a thermocline separating a layer of warm surface water from much colder deep water. You can only "see" the thermocline if you lower a thermometer into the water. This thermocline also exhibits



Geosat heights at 170° E for eight latitudes as a function of time. Negative satellite heights (shaded) are equivalent to sealevel elevations. The overall effect is that of long-period waves moving slowly westward. Wake Island is at 19°17'N, 166°37'E.

saiches, but they are r>+ artlingly different from those on the surface. In Lake Champlain, the period of the internal seiche is 4 days rather than 4 hours. The amplitudes fall between 20 and 40 meters instead of being in the centi- meter range. Just a few meters below the lake's surface, conditions are radi- cally different.

(Hunkins, Kenneth, et al; "Numerical Studies of the 4-Day Oscillation of Lake Champlain," Journal of Geophysical Research, 103:18,425, 1998)



The Lake Champlain seiches under discussion occur in the main section of the Lake on the left.

SURFER CHALLENGES

SURF'S UP ON CALIFORNIAS SHORES: REALLY UP AT CORTES BANK

The biggest waves swashing against Southern California's beaches have grown by 2 meters or 35% sinee 1948.

(Anonymous; "Surf's Up and Up and Up," New Scientist, p. 29, October 27. .2001)

Comment. The Atlantic's waves, too, have been getting larger. (p. 252)

But if you want to surf some true Pacific giants, you must leave the shoreline and head for Cortes Bank 160 miles offshore. There, far out of sight of land, lurks a shallow rock shelf that amplifies wind-driven waves—but only the largest of them. The elliptical swirls of the smaller waves do not reach down to the rock shelf and are unaffected. But when big- ger swells encounter the shelf they are amplifled into giants.

So ehallenging are these waves that. when conditions are right, expert sur- fers boat out to Cortes Bank and wait for the really big ones.

> Mike Parsons caught the first wave at dawn. It was 18 metres tall and moving at around 40 knots. You can't paddle fast enough to get onto a wave like that----you have to be towed by a jet ski. Evan Slater, editor of Swell.com, did try paddling onto a wave, but had to abandón his board and dive deep underwater to avoid being churned by the mammoth grind- ing walls of water.

18 meters is about 60 feet, but oceanographers calcúlate that an 18-meter wave is only 70% of what the Cortes Bank can generate. 25+ meters (80+ feet) is tops.

(O'Hanlon, Larry; "California Screaming," New Scientist, p. 34, July 28, 2001)

WANT BIG WAVES FOR SURFING? FORGET HAWAII AND AUSTRALIA!

June 2, 2003, Bay of Biscay, 3 miles off the border between Spain and France.

The breakers off St-Jean-de-Luz average 8-12 feet in size. But, on June 2, 2003, under a clear sky and with no storm out to sea, the waves kept growing larger and larger. Ultimately, three waves were estimated as being ten times their average height. They easily topped 70 feet —a height long thought impossible in the absence of a quake or undersea landslide.

Surfers on the scene were delighted, but they had to ride jet skis to catch the fast-moving mountains of water.
A wipe-out could have been deadly.

Evidently, the seabed geology sometimes amplifies the normal rollers along this section of coast. The water depth offshore is fairly shallow except for a 2-mile-deep channel (submarine canyon) at Hossegor, 20 miles north of Biarritz. This channel seems to behave like a fun- nel on oecasion, discharging immense volumes of water over the shallow sea floor.

(Hanion. Michael; "The World's Biggest Waves (No, Not Australia, Just across the Channel)," London Daily Mail, Sep- tember 16, 2003. Cr. A.C.A. Silk.)

Comments Unanswered is the question of why immense quantities of water sud- den charge out of the submarine, canyon.

Note that the giant waves that sometimes appear at Cortes Bank 160 miles off the coast of Southern California are amplified by a submarine ledge------a dif ferent mechanism from that proposed for the European coast. (See the pre- ceding entry.)

MARINE MISCELLANY

RUBBER DUCKIES CHASE NIKE SHOES ACROSS PACIFIC

January 10, 1992. Mid-Pacific Ocean.

Remember that amusing Ítem in vol. 1, p. 281, about the 80,000 Nike shoes that were lost overboard in the Pacific in 1991? These floating shoes washed ashore months later in Cañada and Alaska, car- ried thousands of miles by prevailing currents. Well, it's happened again.
This time, eleven steel containers fell off a cargo vessel in the North Pacific near the International Dateline. The containers released 29,000 bath toys: duckies, turtles, froggies, and beavers. Ten months after the spill, the first yellow duckies washed ashore in Cañada.

These spills are useful in charting ocean currents but, except for wry Fortean contení, are of little import to anomalists. However, there is one pre- diction of the Computer models that is worth noting: Some of these bath toys may make it through the Bering Strait, across the Arctic Ocean, down past Greenland, and onto Atlantic shores.
So, keep your eyes open at the beach!

(Anonymous; "Rubber Ducky Armada Crosses Pacific," Science News, 146: 254, 1994. Carlton, Jim; "Tub Toys Are Ducky Ocean Researchers," Wall Street Journal, September 30, 1994. Cr. J. Covey.)

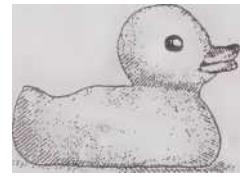
FAR-FLOATING FOWL

January 10, 1992, North Pacific Ocean near the International Dateline.

Eleven steel containers fell off a container ship liberating 29,000 bath toys, among them thousands of yellow, rubber duckies. In above announcement of this accident, we reported that 10 months later the duckies were making landfalls on Canada's Pacific shores. A Computer model hinted that they might even make it into the Atlantic.

It has turned out that these rubber duckies do indeed possess great stamina and remarkable navigational skills.

On July 12, 2003, BBC News Online proclaimed that some of the rubber duckies were now off New England shores preparing landings. In just over 4 years, the bath toys had apparently laid a course north through the Bering Strait, across the Arctic Ocean, and down past Greenland and the Canadian Maritime Provinces.



(Anonymous; "I Began to Cali Them Hyperducks," New Scientist, p. 8, July 19, 2003)

Comments. If mindless duckies can make such journeys, why not ancient humana have been able to make the trip during earth warmings?

Will some of the duckies eventually reach Europe? Could some round the Cape of Good Hope and return to their native Pacific waters?

In vol. 1, p. 281, we described the trans-Pacific travels of 80,000 Nike shoes. However, none of these floaters seem to have made it into Atlantic waters.

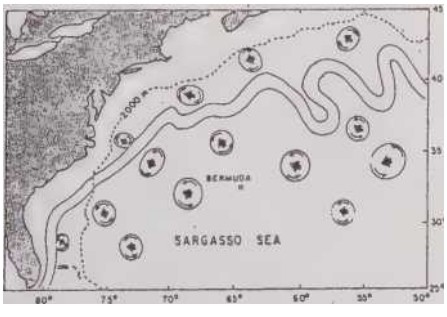
GULF STREAM REVERSAL?

Don't panicl There may be a rational explanation for the observations now re-counted. The time is early August 1928.

> Reversal of the direction of the Gulf Stream in mid-Atlantic has been reported by two steamship captains arriving recently from America;
>
> They said that the Stream was flowing westward instead of eastward. This has aroused much interest in meteorological circles and Borne popular disquietude lest it portend a change in the British climate. Scien- tific authorities, however, assert that the phenomenon is an ísolated affair and that the return of the Ice Age to the British Isles is nothing for the present generation to worry about.
>
> Captain Parker of the S.S. Homeric, which arrived at Southamp- ton Saturday, reported that the Stream showed its reversal of course from longitude 50 west to longitude 40 west.
>
> The irregularity was observed recently in practically the same location by Captain Metcalf of the S.S. Majestic.

(Anonymous; "Gulf Stream Reverses Its Direction; British Isles Fear Return of the Ice Age," New York Times, August 7, 1928. Cr. M. Piechota)

Comroent. The Gulf Stream does meander, but it doesn't reverse over the short run—the long run, maybe. A better explanation is that the ships sailed into one of the giant current rings or vor- texes discovered in the Atlantic in recent years. See accompanying figure.



Typical distribution of current rings in the North Atlantic. See GHT7 in our catalog Earthquakes, Tides for details.

THE 627-FOOT WATER SUDE BETWEEN AUSTRALIA AND INDIA

The world ocean, when viewed close-up from ship or airplane, displays the familiar microstructure of waves and currents. The view from a satellite, thousands of miles up, is startling to say the least. Huge bulges hundreds of feet high and hundreds of miles in ex- tent appear when satellite radar altimeter data are plotted. Equally lar ge depressions in the ocean surface also show up—none obvious to sux*face ob- servers. This unexpected macrostruc- ture of the ocean surface is shaped by variations in the strength of the earth's gravitational field and sea-bottom ter- rain. Wherever the gravitational field is stronger, it creates a depression on the fluid surface. Germán geophysicists, in fact, have drawn a global map of the ocean's large-scale topography, as measured from the European Space Agency's ERS-1 satellite. The surface of the world ocean departs wildly from a smooth sphere. On their colored map:

> Brilliant pink and red areas are continental-size mounds of water most notable northeast of Australia, where the sea topography is up to 85 meters (280 ft.) higher than the standard ocean level. Just to the west near India, deep blue indicates a 105-meter (346-ft.) deep depression in the sea surface. Major differ- ences in the gravity fields and ter- rain underlying the two regions cause a variation of 190 meters (627 ft.) in sea surface topography be- tween these two adjoining areas.

(Covault, Craig; "ESA Radar Scans Global Ocean," Aviation Week, p. 42, October 24, 1994. Cr. J.S. Denn)

LIFELESS BAND OF COLD WATER

In July, the coastal-water tempera- ture along the beaches of Florida's Pan- handle are usually in the upper 80s.
This year (1998) bathers were benumbed when water temperatures fell suddenly into the low 70s. The band of coid water, which can be detected by satellites, is 15-20 miles wide. It stretches from the Alabama line east to Panaraa City, Florida. The best scientifie guess is that the coid lens of water welled up from the 6,000-feet-deep Desoto Canyon 30 miles offshore.

Usually cold-water upwellings are rich in nutrients, but this band is low in dissolved oxygen. Consequently, it is full of asphyxiated and lethargic sea life. Warm-water creatures, such as electric rays, have been driven into shallow waters, where they have never been seen before, by the advancing strip of inhospitable fluid.

> "Nobody has ever seen anything like this before," said Gary Fitzhugh of the National Marine Fisheries Service in Pensacola. "And nobody has come up with an explanation about what's causing this phenomenon."

(Anonymous; "Scientists Mystified by Lifeless Band of Coid Water," Baltimore Sun, July 16, 1998.)

A LINE IN THE SEA

What would create a deep greeñ line 10 kilometers wide and stretching for hundreds of kilometers across the azure Pacific? Sailors have remarked on this line as their ships clove it. It is so lar ge that astronauta on the Space Shut- tle Atlantis have photographed it from hundreds of kilometers up. Sampie analy- sis proves the green line to be a parti- cularly dense concentration of phyto- plankton, which thrives along the boun- dary where the North Equatorial Counter- current meets the colder South Equatorial Current. The microorganisms feed in the richer, cooler, sinking waters of the latter and then rise to the surface to create the green line.

(Yoder, James A., et al; "A Line in the Sea," Nature, 371:689, 1994. Adler, T.; "Microorganisms Create a Line in the Ocean," Science News, 146:263, 1994)

Comment. Even more unusual lines may be created where oceanic currents meet. For example, in 1932 an immense eon- gregation of sea snakes 10 feet wide and 60 miles long was observed in the Malacca Strait. (vol. 1, p. 149)

WHEN CE WHITINGS?

Curious clouds of fine white partióles often decórate the surface of the warm, shallow waters around the Bahamas.
Called "whitings," these clouds of suspended material are not minor phenomena to file away and forget. Some of the bright streaks are 200 square kilometers in area and can be seen from the Space Shuttle.

The source of the whitings has not been determined with certainty. The locáis claim that schools of fish stir up the fine, white, caleareous sediments.
This is doubted because fish are very scarce in the areas where whitings occur. Another thought was that calcium carbonate was being precipitated directly from the ocean water. Chemical tests showed this to be impossible. A new theory has schools of sharks intention- ally raising clouds of bottom sediments to blind fiBh. The sharks then move in with their electrosensitive organs, which are unaffected by the "white-out," and pick off the helpless fish.

(Copley, Jon; "Sneak Attack," New Scientist, p. 22, December 2, 2000)

Comment. It would take a lot of sharks to stir up 200 square kilometers of sedi- ment! And why bother if fish are scarce where whitings are seen?

A similar phenomenon is seen in the sudden whitenings of the Dead Sea. Details in GHC4 in our catalog Earthquakes, Tides.

LAKE MICHIGAN'S ANNUAL SILT PLUME

The Ítem on the Caribbean "whitings" above' brought forth an article from a Chicago newspaper describing a similar phenomenon. Every spring a great plume

oí silt—an estimated million tons o£ it —is stirred up by winds and currents 011 Lake Michigan. This plume is easily visible to those who care to brave the bitter weather that time oí year. The 125-mile-long chalky plume stretches along the shore from Wisconsin, past Illinois, around the Southern tip oí the lake, and up along the Michigan shore. The plume lasts several weeks and is easily seen by satellites high overhead.

(Kendall, Peter; "Scientists Plumb Mys- tery oí Lake Plume," Chicago Tribune, February 1997 or 1998. Cr. J. Cieciel.)

Spring ■winds and currents sometimes stir up a 125-mile-long chalky plume on Lake Michigan.

WHERE WATER AND VEHICLES RDN UPHILL ----------OR SEEM TO!

Chinese scientists are baffled by a slope in north-western Gansu pro- vince where water runs up the incline rather than down, the official Xinhua news agency reported yesterday.

The 60-m-long slope at an angle oí 15 degrees was discovered by Army offieer Zhao Guobiao in a desert región oí Yugur autonomous county, it said.

Unpowered vehicles, too, are said to roll up this mysterious slope, just as thoy seem to at Spook Hill, Florida, and many other places, (p. 303)

Physics professor Fang Xiaoming from Lanzhou University, who investigated the phenomena, speculated that geo- roagnetism or changes in air pressure might explain the contrary flow oí the water!!

(Anonymous; "Water Flows Uphill on Gansu Slope," Singapore Sunday Times, November 8, 1998. Cr. C. Ginenthal)

Comments. The gravity-defying pheno- mina at Spook Hill and all "magnetic vórtices" that have been carefully in- vestigated are definitely illusory. The road at Spook Hill slopes downward despite what our eye-brain Computer tells us.

Also pertinent is the uphill flow oí w-ter in irrigation channels. A sight to be seen in the American West. Oí coarse the water loses some kinetic cnergy in the process.

EAST WIND DRIES UP NIAGARA FALLS — WELL ALMOST!

The phenomenon at hand is not anoma- lous, but it is too delightful to let escape.

November 5, 1933. Niagara FaHs, NY.

Visitors to Niagara today were aston- ished to find the Great Falls only a remnant oí past beauty, because an east wind had held back the flow from Lake Erie. Nobody living here now ever saw the falls so depleted.

The American Fall was a very thin curtain and the Horseshoe had lost all of its water-face between the cen- ter of the horseshoe formation and Goat Island.

The rocks around Terrapin Point and for two miles back up the river far above Goat Island were bare, and persons walked all around the Three Sisters Islands, while aU the other small islands above the falls on the American side were accessible by foot.

(Anonymous; "East Wind Backs Up Niagara Falls Flow; Amazed Visitors Walk Dryshod to Islands," New York Times, November 6, 1933. Cr. M. Piechota.)

THE LONG REACH OF THE HAWAIIAN ISLANDS

From aireraft and satellites, one can see strong contrasts in the roughness of the ocean surface in the lee of those idyllic islands with their volcanic peaks that poke over 10,000 feet into the Pacific airstreams. These long streaks on the ocean surface are called "wind wakes."

The wind wake leeward the Hawaii is spectacular. These islands are swept by steady northeast trade winds. Mauna Kea (4201 meters), Mauna Loa (4201 meters), and other Hawaiian peaks penétrate high above trade inversión. Together they create a visible wind wake some 3,000 kilometers long to the West----many times greater than any other island wind wakes to be seen on the planet.

The effects of these soaring peaks are more than visual. Their wind wake drives an eastward ocean current that, in turn, draws warm water away from the Asian coast 8,000 kilometers distant from Hawaii. Thus, a few island moun- tains affect the climate of a continent a fifth of the way around the globe!

(Xie, Shang-Ping, et al; "Far-Reaching Effects of the Hawaiian Islands on the Pacific Ocean-Atmosphere System," Science, 292:2057, 200i)

Comment. The Hawaiian wind wake is not anomalous but it is surely interesting.

ANOMALOUS GEYSERS

An article on neutrón stars in Science begins with a phenomenon that seems light years distant from the subject advertised.

Steamboat Geyser, in the heart of Yellowstone National Park, usuaUy shoots fountains of water 5 to to 10 meters high. But at irregular intervals of years to decades, the geyser unleashes a scalding 100-meter column, followed by a deafening roar of steam for a day or more. A mysterious trigger far underground expele the deepest, hottest water from the geyser's hydrothermal system in a crowd-pleasing burst.

(Irion, Robert; "Ashes to Ashes: the Inner Lives of Neutrón Stars," Science, 297:2199, 2002.)

Comments. The article just quoted moves on to its more profound subject matter, leaving the reader to ponder why a geyser, usually assumed to be rather "faith- ful," would go berserk at such widely spaced times. It is known (but poorly understood why) that earthquakes can change the periods of normally well- behaved geysers. So, it might be that Steamboat Geyser sometimes responds vociferously to quakes that are so distant that no one connects the two pheno- mena.

As an example of the long geographi- cal reach of earthquakes, the 7.9-magni- tude Alaskan quake of November 3, 2002, dropped the groundwater level 6 inches in Pennsylvania, alraost 4,000 miles from the epicenter. Tap water from wells also carne up dirty. Changes in the level of a geyser's water table could cause de- viant aetivity.

(Marzuola, C.; "Shaked Alaska," Science News, 162:307, 2002.)

Another possible influence on Steamboat Geyser might be the buildup of subter- ranean gases unrelated to either hydro- thermal action or earthquakes. In YeUow- stone, not far from the erratic Steamboat Geyser, is the Cráter Hüls Geyser, a rare cold- water geyser that is presum- ably gas- powered. The same suspected gases might also throw hot-water geysers, like Steamboat, off their temporal strides.

(Rinehart, J.S.; "Geysers," Eos, 55: 1052, 1974.)

The effect of the 1959 Hebgen Lake earthquake can be seen in this plot of yearly averages of the intervals between eruptions of Oíd Faithful in Yellowstone National Park.

EXOTIC SEISMIC SIGNALS

UNDERWATER THÜMPS

> Scientists based on the centra] California coast are trying to identify the origin of a mysterious underwater sound that disturbed surfers and divers for three weeks------and then just as mysteriously disappeared.
>
> The sound, made up of thumps occurring at 10-second intervals, was compared by one diver to five or six giant bongo drums going off simultaneously. Most experts have concluded that it was of human origin

As usual in such cases, no govern- mental or military sources knew any- thing about the thumps.

(Shurkin, Joel N.; "Underwater Thumps Bafíle Ocean Scientists," Nature, 371: 274, 1994)

A SUBTERRANEAN TROMBONE

In 1992, while making seismic recordings near Java's Mount Semeru. a Germán scientific team noticed that the seismic waves were much more regular than one would expect from deep volcanic activity. Their recordings revealed a series of evenly spaced harmonio frequencies.
They likened it to a musical instrument emitting a fundamental note accompanied by overtones. Sometimes, the fundamental tone would rise and fall, as if the mountain were playing a tune for them. The Germans, V. Schlindwein et al, pos- tulated that the vibrations originated in a gas-filled cavity, presumably cylindri-
cal----something like an organ pipe—capped at the top, with a pool of molten magma at the bottom. Volcanic vibrations resonated in this chamber and, as the magma pool rose and fell, so did the fundamental tone. Rather than a fixed organ pipe, it was a natural trombone!
Unfortunately, the "earth music" was always in the infrasound range, 8 Hertz and less, and could not be heard by
the researchers direetly------only their instrumenta could "listen."

(Schneider, David; "Country Music," Scientific American, 273:28, November 1995)

Comments. There is no physical reason why such a subterranean trombone ean- not play in the audible range. Such a mechanism might explain some of the mysterious hums heard in various locali- ties, such as the Taos hum. (p. 259) Some animáis can hear infrasound. Pigeons, for example, have special or- gans on their legs (of all places!) that respond to infrasound. Could pigeons and other birds use "musical mountains" for homing and other navigation feats?

A SUBMARINE ORGAN?

Exactly two years ago, we reported on strange seismic signáis detected by Germán geophysicists near Mount Semeru, in Java. These signáis consisted of a fundamental tone and evenly spaced harmonios. Sometimes, the fundamental tone rose and fell. This "natural trombone" was thought to be a gas-filled subterranean cavity capped at the top by rock, with a pool of magma at the bottom. Volcanic vibrations resonated in this chamber. As the magma pool rose and fell, the fundamental tone changed.

More recently, a network of seismic stations in French Polynesia has picked up more mysterious seismic signáis.
These differ from those in Java in that each fundamental tone is "puré"; that is, there are no harmonios. Dubbed "T-waves," the sounds originated from an active volcanic ridge in the South Pacific. Suspicion fell on one flat-topped volcano that rose to within 130 meters of the ocean surface. But, how could this peak generate such a puré tone?

The theory is that the active volcano spews out a column of steam bubbles bounded at the bottom by the fíat volcano and by the ocean at the top. Computer simulations proved that sound could resonate in a column of bubbles just as it does in an organ pipe. Since the height of the column remains fixed, so does the fundamental tone. Certainly harmonios are generated, too, but the bubbles damp out the higher frequencies, leaving a puré tone.

(Schneider, David: "A Blue Note," Sci- entific American, 277:18, August 1997)

Comments. The resonating-bubble-cloud theory was proposed in a 1996 issue of the Bulletin of the Seismological Society of America.

TRAIN, WHISTLE, SLOWDOWN, BLOOP

During the 1960s, the U.S. Navy set up a worldwide network of underwater hydrophones to listen for Soviet sub- raarines. Many of these listening instrumenta were placed at depths where sound is trapped in a layer of water by the ambient temperature and pressure. Sounds emitted in this layer can travel thousands of miles with little attenuation.

Called SOS US (Sound Surveillance System), this far-flung array of "ears" heard more than submarine noise. There were the songs of whales, of course, and other recognizable sounds from the known denizens of the deep. The creaking of the earth itself and even the ocean currents could be heard.

Beyond the easily identifiable sound sources are four named in the title for their characteristics. Also common enough to be named were Upsweep, Fox, and the Gregorian Chant—all distinctive and profoundly mysterious.

Upsweep, a rising puré tone of a few Hertz, was traced to a submarine volcano in the South Pacific. It is hypothesized that somewhere with in the volcano there is a column of gas resonating like the air in an organ pipe. (See above.)

The sound named Slowdown seems to origínate in Antárctica as ice sheets scrape over shallow seamounts. (below)

The rest of the named sounds and many others not thus dignified remain mysterious. Certainly, some are from natural geophysical processes and known animáis, but almost certainly, somewhere out there, swim lar ge, voluble creatures unknown to Science.

(Wolman, David; "Calis from the Deep," New Scientist, p. 35, June 15, 2002.)

WEIRD VIBES FROM THE ANTARCTIC

"Vibes" here means "pressure waves." Surging out of the Antarctic, these pressure waves collide with islands in the South Pacific and jostle seismometers there installed. These are not tsunamis or waves that can be seen on the ocean surface. Rather, they are vibrations concentrated at a few select frequencies inaudible to the human ear. These vibes were first noticed in August of 2000.
Over the next five months, thirteen groups of pressure waves fanned out across the Pacific for thousands of miles. Some of the events lasted only 2 minutes, others persisted for hours.

It was easy to pinpoint the sources of the vibes. They were huge icebergs in the Ross Sea calved off the Ross Ice Shelf. It is not known exactly how the pressure waves are generated. Perhaps winds and currents cause the bergs to rub against each other or scrape the shallow Bea bottom. Given the size of some of the bergs (40 x 135 kilometers), some major seismic phenomena are to be expected.

(Anonymous; "Monitors Get Weird Vibes from Antarctic," Science News, 161:286, 2002)

Comment. Vibrations associated with polar ice have been recorded before.
For example, as winds howl across the Arctic's Chukchi Sea, the sea ice vi- brates like a drum head. "Icequakes" have been reported at several bases in the Antarctic. Over a century ago, when F. Nansen's ship, the fram, was frozen solid in the Arctic ice, the explorer wrote:

> First you hear a sound like the thundering rumble of an earthquake far away on the great waste; then you hear it in several places, always coming nearer and nearer. The silent ice-world re-echoes and thunders; nature’s giants are awakening to battle. The ice cracks on every side of you, and begins to pile up; all of a sudden you too fínd yourself in the midst of the struggle. (Farthest North, p. 166, London, 1897)

CRÜSTAL MDSIC

A seismic symphony has becn played every 74 years since the 150Os along the Bohemian Massif on the German- Czeeh border. This "musió" consists of swarms of small-to-moderate earthquakes. During the autumn of 2000, some 10,000 events were recorded. Scientists know when the symphony is about to begin because, in the preceding- 4-5 weeks, the water levels in wells and mineral springs change.

The seismic songs seem to be caused by deep-flowing magma. But why the regular 74-year beat?

(Chin, Gilbert, ed.; "Bohemian Rhapsody in the Crust," Science, 299:475, 2003)

EXOTIC SEISMIC SIGNALS

Not all terrestrial tremors emanate from buckling crust and slipping tectonic plates. The crashing of large waves on a seashore sends "microseisms" to sensi- tive instruments hundreds of kilometers - ' away. The bubblings of Oíd Faithful geyser give rise to an enduring and engag- ing "harmonio tremor."

As for the more "exotic" sources of seismic signáis, they had an entire ses- sion devoted to them at the Fall 1996 rneeting of the American Geophysical Union. Here are two of the unusual seismic events presented there.

July 10, 1996, Yosemite National Park.

> At 6:52 pm PDT Wednesday, July 10, 1996, a large block of granite, with an estimated mass of 80,000 to 184,0 tons, detached from the cliff between Washburn Point and Glacier Point, in Yosemite Valley. The rock mass subsequently launched from the cliff and free-fell ballistically an estimated 550 m before impacting approxi- mately 30 meters from the base of the cliff in the Happy Isles area of the valley floor in Yosemite National Park...This rock fall was well recorded by 3 UC Berkeley (BDSN) and Caltech (TERRAscope) broadband seismographie stations and 15 short- period seismographie stations (opera- ted by the USGS in Menlo Park and the University of Nevada, Reno). In fact, it is the largest vertical rock free-fall ever recorded seismically and it registered on seismographs up to 200 km distant.

(Uhrhammer, R.A.; "Seismic Analysis of the Yosemite Rock Fall of July 10, 1996," Eos, 77:508, 1996)

December 9, 1995. Southern Ecuador.

> On the afternoon of December 9, 1995, a bolide exploded in the atmo- sphere over the Andes in Southern Ecuador. Many people in nearby towns witnessed the event. They reported seeing a streaking meteor, which ter- minated in a loud and brilliant explosión. In some locales, the flash was noticeable even through cloud cover. The burst of light was observed by satellite optical sensors used to de- tect atmospheric nuclear tests. Three local seismic stations also recorded signáis from the explosión... This bolide appears to be unique in that it was observed by eyewitnesses and located by both satellite and ground-based sensors.
>
> The sound of the meteor's explosión was heard at least 56 kilometers away.

(Chael, Eric P.; "Seismic Signáis from a Bolide in Ecuador," Eos, 77:508, 1996)

WHEN THE EARTH GETS CRACKING

November 14, 2001. Tibetan Plateau, China. The Kunlunshan Earthquake.

The quake magnitude was a hefty 8.1. It created the largest surface crack of modern earthquakes—400 kilometers in length (250 miles). The long crack was impressive enough, but the speed of the rupture surprised the most jaded ■ geophysicists. Based upon seismic data, the crack opened slowly at first but then sped up 5 kilometers/second (11,250 miles/hour). This is much faster than the speed of sound at the earth's surface.

(Anonymous; "Rip'n'Roar," Scientific American, 289:34, October 2003)

Comment ■ The Kuhnunshan quake was in a remóte area, and no acoustic or luminous phenomena were noted.

Observers of lake-ice phenomena, (mostly ice-fishermen) sometimes see long cracks appear explosively—almost instantaneously.

A BAD ASSUMPTION MAY OBSCURE DARK MATTER

A global network of about 5,000 seismic stations continuously registers a caco-phony of weak earth sounds. Most are from of tiny quakes (microseisms), earth-groanings, heavy trucks, miners' digging and blasting, the crashing of ocean breakers. The biggest sounds come from major quakes and nuclear detonations.
All of these seismic noise-makers are "point sources"; i.e., "localized."
All "non-point" seismic noise is con- sidered to be (we have to pun this one) "pointless." These random data are ignored as valueless and not worth analyzing. This inattention this could be a big mistake from the scientific point of view!

This unlocalized seismic garbage may, in fact, harbor records of unappreciated events of profound scientific importance. For example, one finds in this throw-away seismic data sound sources traveling along straight lines within the earth at about 400 kilometers per hour. What sort of entity might make these sounds?

Of course, these linear disturbances could be geological in origin, but a more interesting interpretation ascribes them to the penetration of the earth by clumps of that enigmatic dark matter about which we know next to nothing. If one as sumes —as some physicists do—that these clumps of dark matter consist of ultra- dense "strange quark nuggets" about 10 microns in diameter, such entities would send out "sonic booms" as they plow through the earth's integument.

(Samuel, Eugenie; "Rumble Bungle," New Scientist. p. 15, May 18, 2002.)

Comment. In the above hypothetical picture, the earth-as-a-whole is analo- gous to the classical cloud ehamber of ti ' pioneering atom-smashers. Rather than visible tracks of subatomic partióles, the global seismic array may be "seeing" the tracks of unsuspected projectiles of dark matter impacting our planet. Of course, there is a lot of other "strange" stuff in outer space, and probably some in inner space, too.

THE POSSIBLE DETECTION OF TWO QUARK NUGGETS PIERCING THE EARTH

Above, we related how "ultra-dense, strange, quark-nuggets" could, in theory, completely pierce the earth, leaving behind the seismic equivalent of a sonic boom. These exotic particles, measuring only about 10 microns across, are thought to be emitted by equally exotic cosmological processes. They are calculated to zip through our solid planet in straight lines at some 400 kilo-meters/second.

After a diligent search of over one million seismic events amassed over the years by the global network of thousands of seismic stations, some patient research- ers found two events, both occurring in 1993, that have the earmarks of quark- nugget passages through the earth.

> In two cases, the arrival times and forms of seismic waves at nine far- flung stations pointed to linear bursts of energy. The ruptures ripped through the planet at hundreds of kilometers per second rather than fracturing near the surface, as typi- cal earthquakes do.
>
> One event occurred on 22 October, 1993, when, according to the research-ers, something entered the Earth off Antárctica and left it south of India 0. 73 of a second later.
>
> The other occurred 24 November, 1993, when an object entered south of Australia and exited the Earth near Antárctica 0.15 of a second later.

(Whitehouse, David; "Did Quark Matter Strike Earth?" http://news.bbc.com.uk/ 2/hi/science/nature/2502755 .stm, November 22, 2002. Cr. H.II. Henry.)

EARTHQUAKE RIPPLES IN THE IONOSPHERE

During the January 1994 Northridge earthquake in California, the ground surface acted like a drumhead. By suddenly shoving the surface upwards by about 40 centimeters, the quake generated atmospheric disturbances that spread skyward at velocities of 1,0002,200 kilometers/hour. Upon reaching the ionosphere, the waves created rip- ples that were detected by the array of navigational satellites that make up the Global Positioning System (GPS).

(Monastersky, Richard; "Bouncing an Earthquake off the Sky," Science News, 146:415, 1994) ----------

Comment. The great 1964 Alaskan quake not only blasted the ionosphere, it generated air waves that were detected by a microbarograph at Berkeley, California, 3,130 kilometers away. See GSW2 in our catalog Earthquakes, Tides.

ANOMALOUS SOUNDS

UNEXPLAINED BOOMS

MORE CAROLINA BEACH BOOMS

January 25, 2001. North Carolina coast.

About 11 PM, residente of Wilmington, North Carolina, just north oí Cape Fear, were startled by deep booms that shook houses. Anxious residents from Wilmington to Bladen County telephoned the National Earthquake Information Center, in Boulder, Colorado, to report the supposed seismic activity. But instrumenta recorded nothing of the sort in the afflicted area. The booms had a different source.

(Anonymous; "Coastal Residents Jolted by Mysterious Booms," Lincoln Times- news, January 29, 2001. Cr. G. Fawcett via. L. Farish.)

Comment. Such booms have plagued the North Carolina shore for many years-------- perhaps centuries. (vol. 1, p. 284) Rather than earthquakes, the booms are more likely due to the spontaneous de- tonations of methane "burps" rising from destabilized methane hydrate, which exists in large quantities off the Carolina shores. (p. 158) The Carolina booms probably are, therefore, analogous to the "mistpouffers" heard along Euro- pean shores and the famous Barisal Guns of India.

HEARD ABOYE CAYUGA'S WATERS

In 1934, Science printed several letters describing and speculating about the so-called "Seneca Guns". (Lake Seneca is one of New York State's Finger Lakes.) The locáis and Indians of bygone days have repeatedly testifíed about the eerie, unexpected booms heard around the shores of Lake Seneca. It seems that the phenomenon is not restricted to this Finger Lake, for a letter from G. Kuchar describes a modern "bombardment" of "lake guns" heard at Lake Cayuga about 15 miles east of Lake Seneca.

> In the early morning hours of August 8th, 1996 (maybe about 6:30 or 7:00 AM), I was awoken by what I thought were loud explosiona of thunder. It was a very loud, abrupt sound, sort of like close-by thunderclaps except that they seemed somewhat distant and yet had no reverberations or rumblings. I went to the window which faced a large building across the way...The early morning appeared warm, humid, and overcast. The explosive "thunderclaps" happened again, a whole series of them, and they seemed to origínate up in the air and to my right, but I could de- tect no flashes of light, and the blasts seemed to come at random points in the sky (which was not very visible to me because of the big building looming across the lawn). I couldn't figure out where the storm cloud was that was producing these blasts, since everything was uni- formly overcast, and there was no darkness moving in or evident in my field of view. From the sound of the blasts, which were very impressive, powerful noises, I pictured in my mind's eye that huge cloud-to-ground bolts of lightning must be erupting somewhere aloft and to the right and out of sight of my position at the window. But they seemed too scattered about, and then one boomed to the rear of my position, and that was soon followed by a blast slightly to the left of that one and way to the left of all the previous ones. Yet, there was no flash of lightning and no dark mass of cloud moving from right to left.
>
> About 2 hours later, a young man who frequents that región told me that what had woken me up was not thunder but what the locáis called "lake farts".

(Kuchar, George; personal communication, August 1996)

Comment. Both the Cayuga and Seneca Guns have been blamed on eruptions of natural gas from the lake. However, no one ever reports flashes of light that would signify spontaneous detonations of such gas. How could non-detonating gas eruptions cause such powerful booms emanating from various directions? For more on these perplexing "water guns", see GSD1 in Earthquakes, Tides, etc. They are actually a worldwide phenomenon; e.g. the famous Barisal Guns heard in the delta of the Ganges.

HUMS

THE TAOS HÜM

Over the years, we have reported on the British hum and the Sausalito hum (vol. 1, pp. 286-287). The latter has been attributed to mating toadfish in the harbor; the former to an under- ground network of gas pipelines. We have resisted reporting many other hums. However, one recently reported hum possesses some sufñciently interesting features. It is called the Taos hum, and it has been bothering some sensitive individuáis in the D.S. Southwest:

> Msre than a dozen people living in an area from Albuquerque to the Colorado border said in July 1992 interviews with the Albuquerque Journal that they had heard the low- level hum.
>
> A Denver audiologist said that she had recorded a steady vibration of 17 cycles per second with a harmonio rising to 70 cycles per second near Taos. The low range of human hear- ing is 20 to 30 cycles per second. (Anonymous; "Defense Dept. Denies Link to Taos Hum," Albuquerque Journal, April 7, 1993. Cr. L. Farish.)

Some residents of Taos are plagued by this machine-like sound that grinds away 24 hours a day, with only oc- casional respites. Some cannot sleep; others complain of headaches. Most people, however, cannot hear the hum at all.

Nevertheless, it is there. Instruments pick it up. In fact, they have even recorded a higher-frequency com- ponent that pulses between 125 and 300 cycles per second.

The cause of the hum is a mystery. One hint comes from the observation that the hum seems concentrated along the Rio Grande Rift, a fault that also runs into Texas and Colorado. One theory blames the hum on the fault's rock surfaces grinding against each other!

(Begley, Sharon, et al; "Do You Hear What I Hear?, Newsweek, May 3, 1993. Cr. J. Covey.)

HUMS HO!

Down the years, several mysterious hums have been recorded in the pages of SF. First, there was the persistent, widespread, annoying "English hum" re- ported in 1977. Most famous has been the "Taos hum" in New México, men- tioned here in 1993, and still going strong. We presume the English hum, the Hueytown hum, and all the others are still driving those who can hear them to distraction.

There have been some desultory in-

quiries into the sources of these hums, but no one has come up with anything more specific than engine noises, wind blowing across chimney tops (an organ effect), or some nefarious secret military projeet.

Whatever the cause(s), the hums have devastating effects on those parti- cularly sensitive to them.

Case 1. Take, for example, the Kokomo, Indiana, hum that started about 1999.

> "Almost immediately after the noise began, nearly every resident reported having chronic and severe headaches and were awakened several times at night and were fatigued." wrote Lisa Hurt Kozarovich, a freelancer. "About 30 residents said they were also nau- seated and had other symptoms----the most common being pressure or ring- ing in their ears, chronic joint pain, dizziness, depression and diarrhea."

(Sharpe, Tom; "Pondering the Hum," Santa Fe New Mexican, July 24, 2001. Cr. D. Perkins via L. Farish.)

Case 2. Residents of southwestern Ger- many are likewise afflieted by an unex- " plained, nocturnal, buzzing noise.

> Many have been complaining of racing pulses and fatigue along with a sense of excitation and uncontrollable mus- ele shiwering during their resulting insomnia.
>
> "Often at night I feel as if my bed were electrically charged. The pillow, the mattress and my whole whole body vibrate, and the only thing you want to do is to be able to turn off that sound,' said one of the sufferers, Carmen Mischke.

(Anonymous; "Mysterious Maddening Buzzing Probed in Southwest Germany," AFP, August 22, 2001. Internet Ítem. Cr. P. Gunkel. Anonymous; "Maddening Buzz," Houston Chronicle, August 27, 2001. Cr. D. Phelps.)

THE KOKOMO HUM

First reported in 1999, we have already mentioned the Kokomo Hum above. This low-frequency hum has been making life miserable for about 90 people in this Indiana town of 7,000. It is described as being akin to the constant idling of large truck by those who perceive it.
But most Kokomo residents hear nothing at all. Those who do also experience nausea, headaches, and dizziness; a condition now called "vibroacoustic disease."

The Kokomo City Council has recently decided that their hum is serious enough to set aside $100,000 to try and track down its source. Proposals have been invited.

(Anonymous; "Indiana Town Marks $100,000 for Study of Humming Sound," Baltimore Sun, May 22, 2002)

Comment. Down the years, the Taos Hum, the Hueytown Hum, and several other hums have made these pages. But we can only allot a few words to what is truly a worldwide problem, There even exist Internet web sites and chat rooms devoted to the subject.

The hums seem to represent a weak, subtle, global phenomenon perceived by only a small fraction of the population. But, then, that's what low-level nocturnal lights are.

(0.20-0.14 Hz), well below the range of human ears. Such low-frequency sounds travel great distances with little attenu- ation. It is thought, therefore, that the "voice of the sea" is an extended source —perhaps the coHective acoustical signa- ture of all the storms from all the world's oceans. But this is surmise.

ActuaUy, the air is full of infrasound emanating from still-unidentified sources, as indicated in the figure.

Humans may not hear infrasound, but a form of "mountain music" seems to have a mysterious, depressing effect upon some of us.

> Some infrasounds that last for as long as several days have been triangu- lated to distant mountain ranges and tend to occur when winds blowing over them exceed a certain speed.
> This effect may be a low-frequency versión of the aeolian tones pro- dueed by the cyclic eddy shedding that occurs when wind flows around obstacles. The reported increase in the incidenee of suicides during epi- sodes of warm downslope mountain winds (called Chinooks in the western U.S. and the Fohn in the Alps) may be due to some as yet unknown pressure fluctuations with 20-to-70 second periods.

(Bedard, Alfred J., Jr., and Georges, Thomas M.; "Atmospheric Infrasound," Physics Today, 52:32, March 2000)

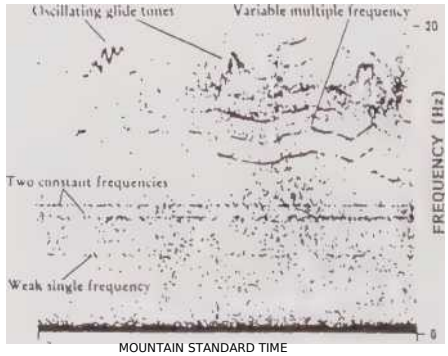
AURORAL SOUNDS

LISTENING FOR THE DNHEARABLE

> They rolled around with a soundless sound like softly bruised silk;
> They poured into the bowl of the sky with the gentle flow of milk.

So wrote R.W. Service, the poet of the Arctic realms, about the eerie voices of the auroras. The low-frequency sound of the aurora is barely detectable by human ears. It is "felt" more than heard, as Service expressed so elo- quently. Some skeptics have maintained that these ethereal sounds do not really exist, but modern instruments confirm that pressure waves are deńnitely pro- duced in the atmosphere as the auroras weave and dance in the sky. Most auroral sound is in the infrasound range, which begins at the lower limit of human hearing—about 20 Hertz. Just enough sound energy seeps over the 20-Hz limit to be heard by sensitive human ears during periods of intense activity.

Another natural infrasound, weak but continuous, is the "voice of the sea." These sound waves, called "mierobaroms," have periods in the 5-7 second range



A sonogram of atmospheric infrasound (1-20 Hz) taken o ver a 30-minute period. The constant frequencies are probably due to unidentified man-made sources; but the rest of the "signáis" and most of the "hash" are of unknown natural origin.

MUSICAL SANDS

WHY SOME SANDS SING, SQUEAK, AND BOOM

Singing sands and booming dunes have aroused the curiosity of explorers and beachgoers for over a century. Sand Mountain, in Nevada, is noted for its energetic thunderings. (vol. 1., p. 214) Manchester, Massachusetts, has its "singing beach." (ESP14 in our eatalog Anomalies in Geology) But, common as these "sonorous" sands are, the exact mechanism of sound production remains deb atable.

D.E Goldsack and colleagues, at Laurentian University, Cañada, have reported some advances in our under- standing of this elassical anomaly.

(1) The group discovered that they could make ordinary sand musical by repeated grinding, polishing, and re- moval of fines. Given sufficient Processing, ordinary sand that is merely "noisy" when shaken can be made to "sing."

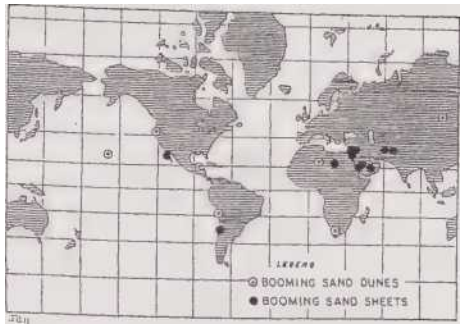
(2) Singing sand has a unique infra- red signature: a broad band stretching from 3,700 to 2,800 cm^{-1}. This is probably due to clusters of water mole- cules in an amorphous silica layer on the surfaces of the sand grains.

(3) Taking a clue from the infrared spectrum, Goldsack et al shook com- mercially available silica gel in a bottle and heard the familiar tones of singing sand!

Their conclusión is that for sand to sing the particles musí be coated with naturally (or artiflcially) created silica gel.

(Goldsack, Douglas E., et al; "Natural and Artificial 'Singing' Sands," Nature, 386:29, 1997. Also: Cohén, Philip; "Desert Dunes Sing Silica's Song," New Scientist, p. 17, March 8, 1997)

Comment. The fundamental mystery sur- vives. Goldsack admits no insights as to exactly how museial sands find their "volees."



Locations of the more prominent musical sands and booming dunes. (Adapted from: Geológical Society of America, Bulletin, 87:483, 1976)

harmonizing groups of puré acoustical notes. These, a Zurich musician likened to the major-C triad and F. (Heim pub- lished his observations in a paper en- titled: "Tone der Wasserfalle." Verhand- lung der Schweizeren Naturforschung Gesellschaft, 8:209, 1874)

In his letter to the magazine Earth (now defunct), Charlie wondered if the same resonant tone-generating mechanism (rising clouds of bubbles) operated in both the oceans and waterfalls.

(Charlie, Wayne A.; "Musical Monotones," Earth, 7:7, June 1998)

Comments. In our catalog Earthquakes, TideB (GQV2), we recorded how waterfalls produce low-frequency terrestrial vibrations with one frequeney predomi- nating. This characteristic frequeney is inversely proportional to the height of the waterfall.

Just as fascinating are the remarkable flashes of light that emanate (rarely) from the bases of waterfalls. These may be due to sonoluminescence. (GLD14 in Remarkable Luminous Phenomena)

MISCELLANEOUS NATURAL SOUNDS

We have already collected accounts of musical valleys and weather' wells (See GSM3 and GHG2 in our catalog Earth- quakes, Tides ■) but never a "weather valley"!

> During his archaeological researches in the Uloa Valley, Honduras (Memoirs of Peabody Museum), Mr. George Byron Gordon made an excursión to the wonderful enchanted ravine, Quebrada Encantada, which was famous through all the country for its weather wisdom. It was situated in a deep valley, and, Mr. Gordon says, "sends forth a loud melodious sound which may be heard many miles away, and is regarded by the people of the región as an infallible sign of rain. In fact, it is a regular weather bureau, with this peculiarity, that it is always reliable; for the sound is so modulated as to indicate by its pitch whether the coming storm is to be heavy or light. The amount of promised rain is in exact proportion to the volume of the sound, and thus it proclaims to the accustomed ear with unerring precisión the approach of a passing shower or heralds the terrific thunderstorm of the tropics; and this is not fiction, but a fact, which one may demónstrate for him- self by going and listening to it."

(Anonymous; "An Enchanted Ravine," Popular Science Monthly, 55:428, 1899)

Comment. Changes in atmospheric pres- sure preceding storms can cause caves and wells to "breathe." By capping a "breathing" well with a whistle, so- called "weather wells" have been created. It is possible that the Honduran "enchanted valley" may be caused by air whistling out of rock crevices as the atmospheric pressure drops.

We quote from a letter to New Scientist:

> About 50 years ago, Lake Erie froze and became covered with a glassy sheet of ice about 50 millimeters thick. As an onshore wind rose, I heard the lake sing with a puré, mid-range, organ-like tone, which rapidly inten- sified to an almost intolerable level with no visible motion on the lake. After a few minutes the ice fractured and the puré tone was replaced by cracking, echoing at about the same pitch and, abruptly, by the atonal roar of shattering ice.

(Sawyer, Charles; "Smashing Song," New Scientist, p. 65, February 8, 2003)

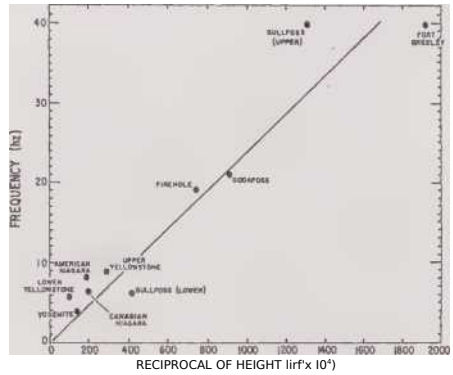
Comment. A more robust example of this wind-driven phenomenon has been re- ported by scientists located on the thick ice covering the Chukchi Sea of the Are- tic Ocean. The huge ice sheet vibrates in the wind like a drum. There is no audible sound but instrumenta can de- tect this very-low-frequeney "music." (GQV3 in Earthquakes, Tides.,.)

WATERFAXL PHENOMENA

Waterfalls are more than just cascades of disorganized water molecules. There must be some structure and regularities in these streams of crashing fluid be- cause waterfalls generate remarkable acoustical and luminous phenomena.

First, we recall those curious puré acoustical tones that have recently been detected by seismic recorders in the ocean near French Polynesia. (p. 267) Geologist W.A. Charlie has associated these tones in the ocean with the strange but well-verified puré tones heard ema- nating from some waterfalls.

Charlie recalls that the famous Euro- pean geologist A. Heim observed that 15 Alpine waterfalls ah produced two non-



The predominant frequeney in waterfall vibrations depends upon the height of the waterfall. (From: Earthquakes, Tides)

ATMOSPHERIC OPTICS

HALOS AND BOWS

HALOS

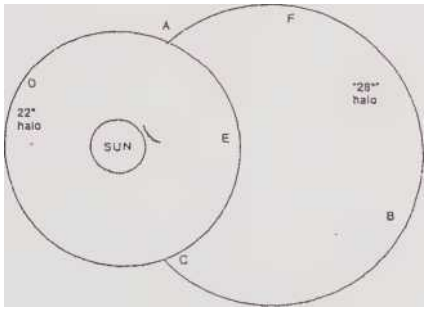
AN OFFSET SOLAR HALO OF 28°

Anomalists should not perfunctorily dismiss unusual halo phenomena as trivial and/or boring. The laws of atmo- spheric óptica have no room for the phenomenon described below. It is just as anomalous as ball lightning, although perhaps not as exciting!

June 22, 1993. North Cornwall, UK.

A 22° halo [the well-explained type] was very prominent, with the sector DCE being exceptionally bright and the colours quite strong. On the right-hand side of this, a larger but fainter halo could easily be seen, having a diameter of about 28° (see figure). It was white in colour. The sector CB was the brightest, sector BF not so bright but easily seen, but the sector AF could be seen only with difficulty. The halo was not seen to penétrate the 22° halo at either points A and C and so it could not be stated positively that the halo would have passed through the Sun, although it looked as though this would have been the case. The centre of the 28° halo had an alti- tude approximately the same as that of the Sun. The phenomenon lasted for about 20 minutes, although the 22° halo lasted for at least another hour.

(Miles, Howard; "An Unusual Solar Halo," British Astronomical. Association, Journal, vol. 103, 1993)



An offset 28° solar halo was observed in connection with the common 22° halo in Enpland on June 22. 1993. 28° halos are rare—even more so when offset as is this one.

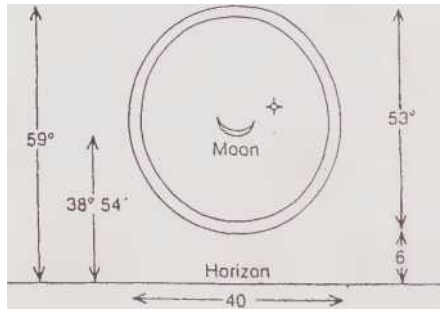
ANOTHER ELLIPTICAL HALO

June 6, 1992. Aboard the m.v. British Skill in the Indian Ocean.

Between 1300 and 1345 UTC, a complete halo phenomenon was observed round the moon, as shown in the sketch. The ring was complete although its appearance was elliptieal. Its horizontal diameter was 40° with its vertical diameter being 53°.

The illuminated part of the moon was not in the centre of the halo, its altitude at the lower limb (phase, new waxing) being 38° 54'. The altitude of the upper part of the halo was 59° whereas the lower edge was at 6°.

(Anderson, P.R.; "Elliptieal Halo," Marine Observer, 63:65, 1993)



Measurements of an elliptieal lunar halo observed over the Indian Ocean.

Comment. Once again we have another observation called "impossible" by geophysicists. Halos, they say, must be symmetrical about the sun or moon. Yet, photos and precise measurements, like those above, demónstrate the reality of the phenomenon.

UNUSUAL LUNAR HALO

July 29, 1993. North Pacific Ocean. From the m.v. BP Admiral.

At 1045 UTC a large, very well defined and complete halo was seen around the 10-day oíd moon. Vertical angles were taken by sextant while horizontal angles were found by gyro repeater.

As shown in the sketch, the area inside the halo was inky black with the inner edge of the halo being very olear cut and well defined: a 'spiked' effect was seen on the outer edge.

(Ronald, J.M.; "Halo," Marine Observer, 64:105, 1994)

Comment. The angular diameter of the halo is normal, but the inky black interior is very rare. The same dark effect is sometimes seen between primary and secondary rainbows and has an acceptable explanation. The radial spikes, however, are not accounted for by halo theory. See our catalog Rare Halos, Mirages.

x-OCCASIONAL SPIKES

"Spiked" effect seen on a lunar halo.

RAINBOWS

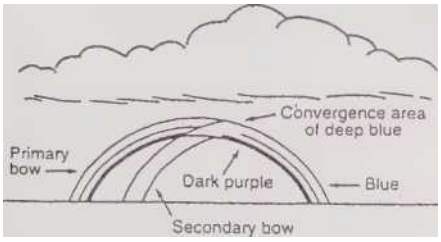
OFFSET LUNAR RAINBOW

May 13, 1998, South Atlantic Ocean. Aboard the m.v. Appleby enroute from Long Beach to Port Talbot.

At 2225 UTC when a light rain shower was falling, a rainbow was seen on the starboard side roughly 2-3 cables from the vessel. It was very clear for about six minutes and was accompanied by a secondary bow after about half that time. The secondary one did not make a complete bow but seemed joined to tb primary bow at its highest point, in a convergence area of deep blue, as indicated in the diagram.

The colours were very clear, with blues and purples visible in both parts Both bows began to fade at about the same time as the moon once again passed behind another cloud.

(Crofts, A.; "Lunar Rainbow," Marine Observer, 69:67, 1999)



A horizontálly offset lunar rainbow.

Comments. Because moonlight is much weaker than sunlight, lunar rainbows are rather rare. Even so, they are not anomalous. It is the offset bow that is difficult-to-explain. Rainbow phenomena should be symmetrical around the line containing the light source (moon, here) and the bow itself. See GEB3 in our catalo g Rare Halos, Mirages, in which we note that no reasonable explanation exists for rainbows offset to one side. However, extra bows offset directly above the main bow can be explained *as* due to reflection of moonlight or sunlight off the surface of nearby bodies of water.

LIGHT PILLARS

TOWERING SHAFTS OF LIGHT

Ice crystals in the atmosphere can daz- zle us with bright haloes, sundogs, and similar optical phenomena-----as long as the sun or moon are shining. Some- times, though, human light sources will create remarkable displays using the same ice crystals. The first of the two examples below is notable for its extreme height; the second provides the accepted explanation.

August 24, 1998. South China Sea. Aboard the m.v. Oriental Bay, Hong Kong to Singapore.

> **Four shafts of narrow vertical light were observed reflected in the sky. Upon Consulting the chart it was revealed that they were ’reflections' of the four fiares of the Kakap Natuna oil terminal, which at this point was 75 n mile away.**
>
> **As indicated in the sketch, the shafts of light were visible above a lower layer of stratocumulus cloud, and, when measured by sextant, their upper tips were ealeulated to be nearly 13 km high. The shafts appeared to be reflected in a thin layer of cirrostratus and, as the vessel approached to 60 n mile from the terminal, the glow from the fiares was also visible on the horizon.**

(Peterson, J.L.; "Optical Phenomenon,” Marine Observer, 69:110, 1999)

Narrovv shaíls oí light in thin

Tall light pillars seen rising above the South China Sea.

February 4, 1999. Toyaroa Bay, Japan.

The caption quoted below is located beneath an impressive color photograph of five tall pillars of light reaching up into the night sky.

> **Rare beams of light rise to the upper atmosphere over Toyama Bay on Thursday. The lights appeared about 2,000 meters above fishing boats with fires aboard to attract squid, for about 20 minutes from 8 p.m. The night illuminations are a rare natural phenomenon in which ügh ts on the ground are reflected in the hexagonal crystals that form in the cirrostratus. According to experts, the phenomenon can only be observed in ideal weather condi- tions when the height of the cloud**
>
> **matches the distance from the source of the light to the observer.**

(Anonymous; Daily Yomiura, February 7, 1999, Cr. N. Masuya.)

Comment. Note that the light source in the first case is much farther away than the height of the clouds—the condition stipulated in the second case!

Sun pillars resemble the light shafts described above. D. Steel has recently mused that a sun pillar might well have been the natural phenomenon that con- vinced the Román Emperor Constantine of the truth of Christianity!

(Steel, Duncan; "A Sun Pillar That Changed the World," Sky & Telescope, 98:12, October 1999)

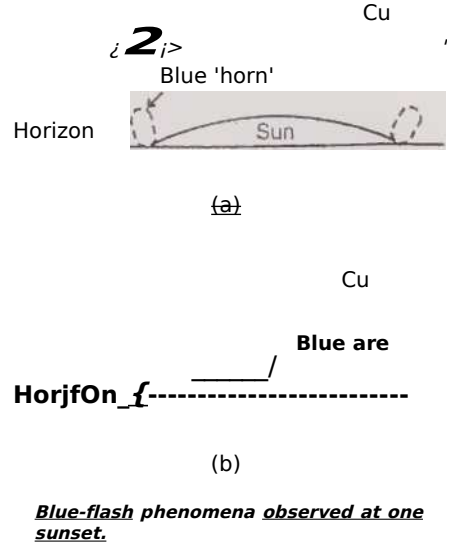
LOW-SUN FLASHES

A BLUE FLASH

Green flashes occasionally appear when the sun (or moon or Venus or Júpiter) sink below the horizon. Blue flashes are much rarer but still well-recog- nized phenomena. An example of the latter was observed in 1995 on the Indian Ocean.

August 11, 1995, Bay of Bengal. Aboard the m.v. Repulse Bay enroute Jeddah to Port Klang.

> **Prior to sunset the vessel was pro- eeeding due east across the Bay of Bengal and it was quite apparent that the sun was still very bright and had not taken on its usual dark- orange or red appear anee; even with half itB diameter above the horizon, the sun was much too bright to view directly. As the last segment of the sun dipped below the horizon, a blue 'horn' formed at each end of it, as shown in sketch (a), and these then closed up to form a bright-blue are, as shown in sketch (b).**



Blue-flash phenomena observed at one sunset.

(Leslie, A.J.; "Blue Flash," Marine Observer, 66:115, 1996)

CURIOUS SHADOW PHENOMENA

Comment. The blue flash is a shorter-wavelength versión of the green flash. The basic phenomenon is explained in terms of dispersión of the sun's spectrum by the atmosphere near the horizon.
Even so, many enigmas remain about these low-sun phenomena. There have been observed: múltiple flashes, flashes preceding sunset, complex flash struc- tures, and the apparent psyehological origin of some flashes. For details, see GEL1 in Rare Halos, Mirages.

SOME GREEN FLASHES ARE YELLOW

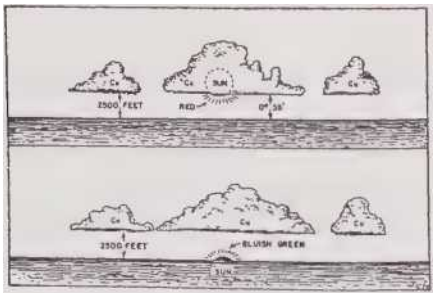
Rarely, green flashes are observed just as the tip of the setting sun disappears below the horizon. Most of these flashes have a perfectly good explanation. The earth's atmosphere acts like a prism and disperses the light of the sun into a spectrum, and the last portion of this spectrum that one usually sees is green. Conditions have to be just right, though. A fíat horizon and a layer of warm air are important. But even when conditions seem perfect, the green flash does not always appear, and all one sees is the —■ red tip of the sun sinking out of-sight.

Even if the patient observer is re-warded by a green flash, he may really have been deeeived, for there are "false" green flashes. A. Young, San Diego State University, reported at a recent meeting of the American Astro- nomical Society on a peculiar type of optieal illusion that can afflict obser- vers of the setting sun. It seems that the intense red light of the sun near the horizon can bleach the red-sensitive receptors in the retina so that an intent observer becomes temporarily color blind to red. When this happens, the observer sees the yellow part of the dispersed solar spectrum as being green (yellow minus red = green). The true green flash may never have appeared at all.

(Seife, Charles; "Don't Let Your Eyes Deceive You," New Scientist, p. 5, June 5, 1998)

Comments. You are right! Blue lies beyond green in the spectrum. Much rarer than green flashes are blue flashes.

Jules Verne even wrote a novel in-volving this famous phenomenon: Le Rayón Yert.



Red flashes are sometimes observed as the bottom edge of the setting sun dips below a sharply defined cloud deck.

ECLIPSE SHADOW BANDS

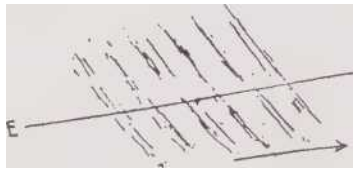
E. Strach had the good fortune to have camcordered those elusive eclipse shadow bands that flit across the ground just before and after total solar eclipses.

The time was February 26, 1998; the place, Knip Beach, Curaco. Strach had first laid out a 53-centimeter-diameter white screen on the ground. He pointed his camcorder at the screen and pressed the ON switch 4 minutes before second contact.

Playing back his recording, he was not a little surprised to find he had an excellent record of the curious parade of the hard-to photograph dark bands.

> **They were clearly seen for 32 seconds before the second contact and a little fainter for 27 seconds after totality. They moved rapidly across the screen from E to W before totality and from NNE to SSW after 3rd contact. Slow motion studies of the video show oc- casional merging of the bands and at times they seem to move in opposite directions----probably a stroboscopic effect.**

The widths of the bands varied from 2.36 to 6.63 centimeters.



Eclipse shadow bands sketched during the February 26, 1998, total solar eclipse. (Top) Bands seen before totality. (Bottom) Bands observed afterwards.

(Strach, Eric; "Shadow Bands Recorded at February 26 Eclipse," British Astro- nomical Association, Journal, vol. 108, 1998)

Comment. Theorists have long been challenged by these ghostly, fleeting shadows. Their widths change; their directions and speeds vary; they come in different colors; sometimes more than one set of bands appear; giant bands have been seen. All of these characteristics are difficult to account for in a single theory.

SHADOW DANCE OF THE GNATS

A curious phenomenon was reported recently to the New Scientist.

> **I travelled to Hungary to observe the recent total solar eclipse. About five minutes before totality, my wife and I noticed many curved shadows about 3 centimetres long dancing on a white paper lying on the ground, formed by a swarm of gnats. The shadows were exactly the same shape as the remaining bright portion of the Sun, by then only a thin are of light. Why?**

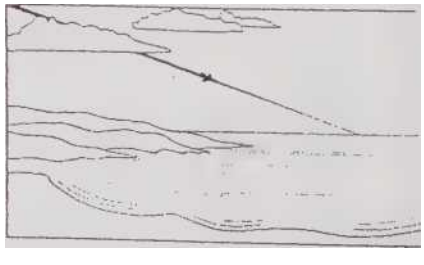
This phenomenon is not anomalous but it is entertaining. It is the reverse of the pin-hole-camera effect often seen during total eclipses. People standing in the shadow of a tree will see many bright ares on the ground-------images of the sun being eclipsed. The interstices between the tree's leaves act as pin-holes. The phenomenon happens in re-verse when pin-holes are replaced by "pins"; that is, small opaque obstruc-tions, such as gnats.

(Scott, Andrew, and Diebold, Mike; "Shadow Dance," New Scientist, p. 93, October 30, 1999)

PDZZLING SHADOWS

August 3, 1997. Dooey, West Donegal, Ireland. The observer, A. Evans, was on a beach aligned north-south.

> **It was a glorious day with some broken cloud over the land but none out to sea. Over the period between 3.00 and 6.00pm, a total of five jets passed overhead, all leaving vapour trails.**
> **Two showed a very Ínteresting pheno-menon, because while the vapour trails extended eastwards, the trails were continued westwards in front of the planes as dark lines which stretched all the way to the horizon. It was as if the plañe was running on an aerial railway. I think it significant that only two of the planes showed this phenomenon as I suspect it was height- dependent. At this time the sun was high and shining from the south-south- west. ■**



Digitized sketch of the contrail phenomenon. Apparently, the contrail's shadow was projected onto the misty atmosphere existing ahead of the plañe.

J.O. Mattsson, Lund University, sur- mised that the black streaks in front of aircraft were shadows of the condensation trails behind the two planes. The shadows were cast forward ahead of the planes upon the hazy, though cloudless, atmo- sphere above the ocean.

(Evans, Alun¡ "Condensation Trail Shadows," Weather, 53:371, 1998)

Comroent. Since the sun was high in the sky, it is difficult to visualize how a the vapor-trail shadow could be cast directly ahead of the aircraft. Hummm!
We suppose that the vapor trails acted like those sunset clouds that produce crepuscular rays. The geometry, though, is a bit different.

ATMOSPHERIC OPTICS MISCELLANY

TUNGUSKA AFTERGLOW

June 30, July 1-3, 1908. England. We quote from a London cable to the New York Times.

> Several nights through the week were marked by strange atmospheric ef- fects which Dr. Norman Lockyer of the South Kensington Solar Physics Laboratory believes to be a display of the aurora borealis, though personally I have not observed any colored streamers.
>
> Following sunsets of exceptional beauty and twilight effects remarkable even in England, the northern sky at midnight became light blue, as if the dawn were breaking, and the clouds were touched with pink, in so marked a fashion that pólice headquarters was rung up by several people, who be- lieved a big fire was raging in the north of London.

(Anonymous; "Like Dawn at Midnight," New York Times, July 5, 1908. Cr. M. Piechota)

Comment. Actually, all of northern Europe saw a suecession of very bright nights beginning June 30, 1908. It was even possible to take photographs at midnight. The cause was not the aurora borealis but rather the Tunguska Event (Siberian Meteor) of June 30, 1908. Of course, Western Europe did not know what had happened in Siberia for years. Terrestrial dust from the Tunguska Event that was blasted into the upper atmosphere or perhaps particulate matter accompanying the impacting object (pro- bably a comet) was apparently the cause of the nightime airglow.

RADIO PROPAGATION

MYSTERY RADIO BURSTS

> Mysterious double bursts of radio emissions, originating near the sur- face of the earth, have been detected by a small satellite designed to spot nuclear blasts.
>
> Although the powerful pulses of electromagnetic energy occur predom- inantly at times of day favored by thunderstorms, they are not accom- panied by flashes of visible light and they do not resemble the emissions generated by classie lightning.

Since November 5, 1993, about 100 of these bursts have been detected by a special radio receiver named "Black- bird" mounted on the Alexis satellite.
Most of the bursts have been recorded over Africa and South America, although they may also be frequent elsewhere but are drowned out by man-made radio noise from the ground.

The bursts come in pairs that are separated by 40 microseconds. The fre- quency dispersión of the bursts indi- cates that the signáis have passed through the earth's ionosphere before reaching the satellite. Most bursts are picked up in the afternoon and early morning.

There is some speculation that the bursts may be associated with the flashes of light recently reported above storm systems. (p. 219)

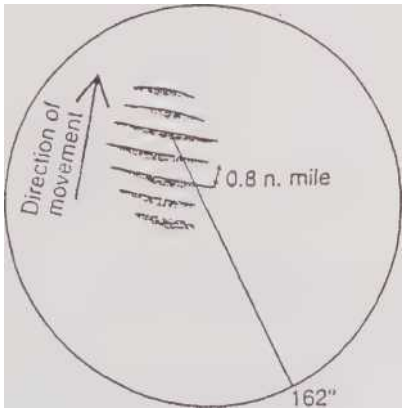
(Quote from: Sawyer, Kathy; "Electro- dynamics: Strange Bursts from the Sky," Washington Post, February 14, 1994.
Also relevant: Monastersky, R.; "Puzz- ling Atmospheric Bursts Spark Interest," Science News, 145:100, 1994. Hecht, Jeff; "Satellite Tunes in to Mystery Radio Bursts," New Scientist, p. 7, February 26, 1994)

ANOMALOUS RADAR ECHOES AND VISUAL PHENOMENON

November 16, 1994. Eastern North At- lantic . Aboard the m.v, City of Durban. Enroute from Le Havre to Capetown.
As seen by three of the ship's officers:

> At 2230 UTC the observers noted on both the 3-cm and 10-cm radars, as well as visually, a wave or band-like phenomenon shown as a suecession of 'bands' approximately 4 n.mile long with a uniform separation of about 0.8 n.mile, see sketch.
>
> The bands appeared as if they were precipitation but on passing through one of them nothing was ob- served ñor were there any other particles [i.e., no wind-blown dust], seeing as the vessel was off the West African coast at the time. The bands themselves caused a rippling effect on the sea surface of roughly 150 m wide, giving an otherwise calm sea a black appearance beneath them on what was a well moonlit night. Although the phenomenon looked like rain bands, the observers could not give an otherwise definite solution for it.

(Herring, R.M.; "Radar Echoes," Marine Observer, 65:170, 1995)



Band-shaped "phosts" seen on radar off the coast of Africa.

ROCHESTER RESIDENTS SEE MIRAGE OF CAÑADIAN SHORE 65 MILES DISTANT

May 16, 1921. Rochester, NY.

On this day, many citizens climbed to the roofs of tall buildings to view a splendid mirage of the Canadian shore located 65 miles north o'f the city.

> The weather was very clear, and the mirage rested high in the northern sky. The colors were a deep blue and near- black, the une ven shoreline being distinctly depicted against the cloudless sky. An occasional forest appeared darker than the regular line of the mirage and indicated that the Bhore line displayed was several hundred miles in extent.
>
> The mirage disappeared about 4 PM.

(Anonymous; "Rochester Sees A Remark- able Mirage of Canadian Shore, 65 Miles Away," New York Times, May 17, 1921. Cr. M. Piechota.)

Comment. This mirage is notable for its clarity and distance. An even more remarkable mirage of the same type appears in our catalog Rare Halos, Mirages. In this instanee, a mirage of the Snae- fells Jokull, an Icelandic peak, was seen from a schooner 335-350 miles distant.

SYLVANSHINE: A NEWLY RECOGNIZED OPTICAL PHENOMENON

Driving along a forested British Colum- bia road on a warm August night, A.B. Fraser noticed that some trees in the dark woods glowed spectacularly in the car's headlights—almost as if they were covered with snow. Obviously snow was out of the question. Instead, the glow was some form of reflection from dew- covered leaves, and only from certain species of trees at that.

> **Later nocturnal expeditions with a powerful flashlight (a proceeding that aroused dark suspicions in at least one local gamekeeper) showed that it favoured only certain types ' of conifer and a few shrubs such as the yew and rhododendron. The ex- planation lies in the contact angle of the droplets on the leaves: as this rises above 90 degrees or so, the proportion of light from the car's headlamps that is reflected back to- wards the occupant increases, and for angles above 140 degrees, the retroreflection becomes spectacular. Blue spruces show the glow particular ly well.**

(Matthews, Lindsay; "Reflections on a Summer's Night," Nature, 369:441, 1994)

Example of sylvanshine on a conifer.

THE STRANGE CASE OF ANGLED LINES IN THE ATMOSPHERE

The subject phenomenon is weird to say the least. We have seen nothing like it before and have no idea how to explain it.

January 30, 1965. Near Johannesburg, South Africa. Testimony of R. Crowder. *'

> **It was the day of Churchill's funeral. I had been flying a Piper-Colt around South Africa's Southern Transvaal, dodging the usual huge CuNims, and headed back to Barag- wanath airfield near Johannesburg as the towering thunderheads ran out of "puff", and began to topple and decay. Corning in to land, it seemed that something was wrong with my eyesight as there seemed to be faint fliekers in the alr itself, only a dozen feet or so above the ground. Taxiing and parking, I found when my wife and I got out of the plañe that there were clear straight lines in the air itself. My wife saw them too. So did half-a- dozen fellow pilots whom I routed out of the bar to act as witnesses.**
>
> **These sky-lines were quite char- acteristic. There were a least half-a- dozen in the air, apparently starting cióse to the ground and fading away twenty or thirty feet up. They were all inclined slightly to the vertical, were of a dirty-brown eolour, slightly blurred, roughly four inches wide, several feet apart, of some depth.**
> **This was apparent when I walked backwards and forwards across them because they appeared to move to- wards and also away from me, an event which seemed to indicate that they were slightly curved. If they were more than a hundred or so feet away, they were lost sight of.**

(Crowder, Robert; "The Strange Case of Angled Lines in the Atmosphere: A Thunderstorm Effect?" Journal of Meteor- ology, Ü.K., 24:220, 1999)

AN EXPANDING SEMICIRCLE OF LIGHT IN THE NIGHT SKY

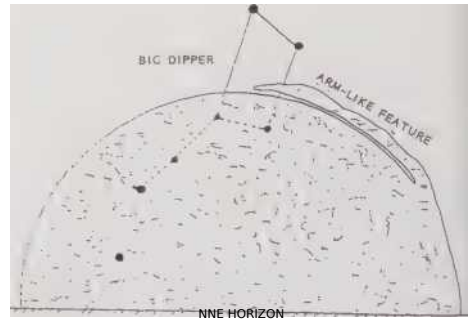
A. Kosa-Kiss, a Romanian scientist, has submitted the following observation to the Journal of Meteorology.

> **At dawn on 1 September 1986, I was preparing to termínate my astronomi- cal observations when suddenly at 0200 UT in the north-north-east a small [luminous] 'bubble'—convex**
> **side upward----appeared in the sky as viewed between two nearby buildings and the farther trees. The bubble ascended slowly, higher and higher, and developed into a huge semicircular cupola or dome before halting for a few minutes. Its homogeneous, uni- form structure was striking as it shone with a strong, silvery-bluish light in the absolutely black sky. By then, the cupola almost completely covered the Big Dipper (Ursa Major) whose five or six brighter stars clearly sent their rays through the phenomenon. The cupola had Sharply- cut edges all round it, until later when a thin arm-like feature sepa- rated from its right topside and bent in the direction of the cupola, while remaining slightly apart from it.**

The semicircle (cupola) of light soon began to shrink and fade. By 02.23 UT it had disappeared. Kosa-Kiss suggested that the phenomenon may have been a precursor earthquake light associated with the Vrancea earthquake of August 31, 1986, that oecurred in the Car- pathians.

(Kosa-Kiss, Attila; "Earthquake Lights, or Celestial Medusa," Journal of Meteoro- logy, U.K., 26:132, 2001)

References. Earthquake lights (GLD8) and expanding balls of light on the hori- zon (GLA15), both in our catalog Re- markable Luminous Phenomena)



August 28, 1986. Sálonta, Romanía. A semicircle of silvery light expanded above the north-northeastern horizon.

Chapter 6

PSYCHOLOGY

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DISSOCIATION PHENOMENA

OVERVIEW

By far the most ¡mportant class pf "psychic behavior" originates in what is termed "dissociation.[11] Dissociative behavior occurs when normal conscious behavior is modified, sornetimes overwhelmed, by subsidiary mental activity. A second-self seems to control the hand of the automatic writer and the speaker's tongue in glossolalia. On occasion, the secondary personality will take over all bodily activity, and we have cases of múltiple personality and possession. Dreams, sleep-walking, fugues, and hypnosis are all manifestations of dissociative behavior in which the waking.mind is pushed into the background.

The important anomalous aspects of dissociative behavior are:

(1) The curious, innate susceptibility of the human mind to dissociative behavior;

(2) The inescapable suspicion that every human mind harbors many "other-selves" residing deep within; and

(3) The strong tendency of the human mind to succumb to religious hysteria and exaltation as well as other all-consuming mind-sets and to theories of "what should be" in Science as well as everyday life.

Why do these propensities exist? What evolutionary valué do they offer? Are they symptomatic of imperfections in the human make-up or do they presage an evolutionary leap towards something bettei---whatever that might be?

In this second volume of Science Frontiers, the emphasis is on sleeping and dreaming. To a large extent this narrowing of the scope of dissociation phenomena has been dictated by what we find most interesting in the current literature. Volume I presents a wider spectrum of this aspect of anomalistic psychology.

HYSTERIA

CONTAGIOUS, COLLECTIVE LAUGHTER

Tanzania, 1962. An epidemic of uncontrollable laughter vías so widespread and intractable that sehools had to be closed for 6 months.

Was this "illness" psychogenic or some kind of viral infection of the brain?

(Cardoso, Silvia; New Scientist, p. 48, May 18, 2002.)

Comment. The literature of psychology provides up with many similar "contagious" human behavioral phenomena: fainting epidemics, dancing manias, the "jumpers" of Maine, etc. These are usually psychogenic rather than pathological.

SLEEP

WHY MUST WE SLEEP?

The November 2, 2001, issue of Science pulís together three eye-opening articles in a section entitled: "Sleep, Dreams, and Memory." A few sentences from this section's introduction make us realize that we are burdened with an apparently inescapable, useless, and sornetimes bizarre physiological function.

> **There have always been teleological arguments for why we need to sleep, but they can mostly be dismissed as descriptive without any real explanatory valué. Indeed, why do homeothermic animáis need to rest and sleep at all, which makes them parti- cularly vulnerable to'predators? Wouldn't it be better and more effi- cient if they were up and running 24 hours a day? So it seems even more mysterious that during sleep we also experience periods of dreaming, with their sornetimes bizarre, incoherent, and highly unpredictable contents.**

(Stern, Peter; "Sweet Dreams Are Made of This," Science, 294:1047, 2001)

But there may be a way to make sleep more useful. For example, some birds, reptiles, and a few aquatic mammals (dolphins, toothed whales, some seáis) have evolved unihemispherical sleep. In this type of sleep, only one brain hemi- sphere sleeps while the other hums away. These animáis sleep but stay alert often with the eye appropriate to the active hemisphere open. Why humans and other "higher" mammals have not developed this useful characteristic is unknown.

(Baker, Fiona; "Half Asleep," New Scientist, p. 97, January 12, 2002)

Comment. With our growing ability to genetically modify organisms, perhaps we can enhance the human genome so as to permit unihemisphere sleep. Then, we can sleep with half our brains, with the other half and one eye trained on the TV or Computer screen.

WHY SLEEP?

The biochemical need for sleep seems scant; there must be other reasons. If there are, they must be important be- cause humans spend one-third of their lives in this helpless state. Sleep is dangerous to creatures lower on the food Chain, and even to warring humans. One has to wonder why sleep evolved at all. (above) It's not only a dangerous state but seemingly time lost from more pro- ductive activities—like finding food or collecting anomalies!

Compounding the mystery of sleep is the existence of two different klnds of

sleep: REM (Rapid Eye Movement) sleep and non-REM sleep. The former is the more interesting.

In non-REM sleep the brain seems to be idling. During REM sleep. however, brain activity resembles that during waking.

> Our most vivid dreams occur during REM sleep, and dreaming is aceom- panied by frequent aetivation of the brain's motor systems, which other- wise opérate only during waking movement... REM sleep also profoundly affects brain systems that control the body's internal organs.

REM sleep adds one more layer to the mystery of sleep. The explanations for sleep (both kinds) sound teehnically impressive but are better characterized as assumptions.

•Non-REM sleep gives brain cells the opportunity to repair themselves.

•REM sleep interupts the release of neurotransmitters allowing brain recep- tors of them to regain full sensitivity.

•The intense activity of neurons during REM sleep in early life allows the brain to develop properly.

(Siegel, Jerome M.; "Why We Sleep," Scientific American, 289:92, November 2003)

THE SLEEPWALKING BANDSMAN

> The penchant of sleepwalkers for high and often dangerous places was noi- sily demonstrated in 1932 when Joseph Furst, a member of the municipal band at Hettstadt, Germany, promenaded at night on the roof of his home, re- hearsing brassily til the neighborhood protested. Though totally unaware of his situation, he carne to no harm. Similar behavior was noted in the 17th eentury in the demon-possessed vic- tims of convent hysteria, and in 1857 during the community outbreak at Morzine. The nuns and the afflicted children would climb tall trees and take to the rooftops, performing amazing feats while in some kind of trance state. There must be a psy- chological explanation, but it remains a mystery.

(Evans, Hilary; "The Sleepwalking Bands- man," The Skeptic, 16:2, Winter 2004. This a UK journal not to be confused with a U.S. publication with the same title.)

The sleepwalking bandsman safely para- ding on his rooftop. Illustration from the Uary Evans Picture Library. Origin- ally from Illustrazione del Popolo.

HOW TO TEST FOR LUCID DREAMING

In a lucid dream, everything seems so real, and you can usually exert some control over the contení and direction of the dream. If you wish, you can fly! Or, you can trigger specific types of lucid dreams by providing external stimuli, such as a specific piece of recor ded music. Some lucid dreams do get out of control, however, and become nightmarish. But pleasant, controllable lucid dreams are the general rule. If you can't seem to get into lucid .dreaming, apply to the Lucidity Instituíe, where you can purchase a Nova-Dreamer machine for $275. Thus armed, you can enter that Never-Never Land anytime you want.

But how does one know he or she is dreaming lucidly? There is a simple test that is not only strange but probably anomalous. During your dream find a shop or traffíc sign, even a dollar bilí or newspaper. Theñ, find a word of four or more letters. Look away, and then look back. If the word has changed when you look back, you are in a lucid dream. For reasons unknown, the brain centers controlling lucid dreaming cannot consistently process words of more than three letters!

(Foremski, Tom; "Designer Dreams," New Scientist, p. 50, December 24/31, 1994)

ANOMALOUS DREAMS

At the 2000 annual meeting of the Society for Scientific Exploration, S. Krippner and L. Faith reported on their analysis of 1,666 dream reports. In this large sample, they identified 134 dreams that they deemed anomalous in one way or another. They classified these dreams as follows:

> In telepathic dream reports, it is the dreamer's impression that the dream correctly identified the thoughts of someone in external reality at the time of the dream. Mutual dreams are those in which the dreamer and someone else report similar dreams on the same night. Clairvoyant dreams concern distant events about which the dreamer had no ordinary way of know- ing. In precognitive dreams, informa- tion is reported about an event that had not taken place at the time of the dream. A past-life dream concerns past events in which the dreamer partieipated but with a different iden- tity than characterizes his or her current life. Initiation dreams introduce the dreamer to a new worldview, or to a new mission in life. In visita- tion dreams, the dreamer is visited by ancestors, spirits, or deities, and is given messages or counsel by them.

Lucid, healing, and out-of-body dreams were also deemed anomalous but were not defined in the abstract. In fact, lucid dreams were the most common type of anomalous dream. Out-of-body dreams carne next. Precognitive dreams were third in frequency.

(Krippner, Stanley, and Faith, Laura; "Anomalous Dreams: A Cross-Cultural Study," Society for Scientific Exploration paper, 2000)

DREAMS

IF WE MDST SLEEP, MDST WE DREAM, TOO?

Sleeping and dreaming have been studied intensively for decades. About sleep in general, C. Heller, a sleep researcher at Stanford, States:

> I think it's the biggest unanswered question in neuroscience.

This admission of mystery begins a iong article on sleeping and dreaming, from which we have extracted three intriguing facts and two profferred explanations. First, the facts:

•Dream reports come almost equally from REM and non-REM sleep. The fact that dreams come from two such disparate brain states makes them much harder to explain.

•In REM sleep the brain (and dreams) - favor the unexpected and the bizarre. Why?

•"If REM sleep has an intellectual function, why do less intelligent animáis spend so much time doing it?"

Now for the promised "explanations":

•REM sleep has a function only in the womb. It persista in adults like our belly buttons!

•REM sleep evolved to keep useful neurons busy thereby saving them from decay without forcing animáis to expend valuable energy in the waking state.

(Lawton, Graham; "To Sleep, Perchance to Dream," New Scientist, p. 28, June 28, 2003)

Comment. We are not too happy with the above "explanations."

Comments. Lucid dreams are especiaUy vivid and, in addition, under the direct control of the dreamer.

Actually, ah dreams are anomalous in the sense that it is difficult to under- stand how dreaming evolved. How can a series of small, random mutations introduce these often bizarre images that drift through the not-so-quiescent, sleeping brain? How could dreaming have had enough survival valué to our distant ancestors to lock it permanently into the human genome?

PRECOGNITIVE DREAMS

For her doctoral dissertation, M.S. Sto- well completed a deep study of precogni- tive dreaming. She approaehed this sub- ject about the only way one can, which is by interviewing people who claim to have had such dreams.

Stowell interviewed five such claim- ants, and it is remarkable how many precognitive dreams they have had col- lectively. There are 51, and 37 of them have been confirmed as accurate. In addition, all five dreamers had precogni^" tive experiences while awake. Many of these were also confirmed. It is impor- tant to bear in mind that it takes only one solid confirmation of preeognition to shatter some sacred paradigms! Here, we might have a couple score of them!

To give the reader the ñavor of this type of parapsyehological research, we select one dream that foresaw a plañe crash. Here is how Elizabeth described her dream:

> It starts out where I'm driving north on the freeway in [City]. Right about by [specific location], going north, heading for the [specific] Bridge, I look up and there's a big plañe coming straight at me, and there's also an overpass right where I am.
> My initial reaction is that it's going to crash on me and that I'm in trou- ble and instead a split second passes in which I realize that I'm going under it, under the overpass, and the plañe will go right over me and crash somewhere behind me. And I realize in that time that it will crash on the freeway and that a lot of people will die and that I, I just wánt to keep driving north and not look back [brief laughter], is my reaction.

Elizabeth told her husband of her dream in the morning. The actual plañe crash occurred a few weeks later just where she had been in her dream.

Many similar, confirmed reports are presented by StoweH in her study.

(Stowell, Mary S.¡ "Precognitive Dreams: A Phenomenological Study. Part I. Metho- dology and Sample Cases," American Society for Psychical Research, Journal, 91:163, 1997) " ” ' ~

Comments. The literature of parapsycho- logy is immense; the above report is just a tiny sample of what's available. There are scores of parapsychology jour- nals and thousands of books at the Lib- rary of Congress. However, we almost never see any mention of all these immense labors in Science, Nature, or even the more adventuresome New Scientist. Why? Mainly because logical positivism, which rules the thinking of mainstream scientists, insists that the only accep- table observations are those that can be experienced by all normal persons. And we don't all have precognitive dreams, or, if we do, we don't recognize them as such! In addition, aneedotal data, dreams, channeled information, and the like are always viewed with suspicion.

Today, some parapsychologists are proposing that science suspend such severe requirements and recognize such phenomena as precognitive dreaming. Only by doing this, they say, will we be able to fully grasp aU of reality.

SEX DREAMS

An unexpected mind-body connection was announeed recently by scientists at Johns Hopkins University. They interviewed 104 mothers-to-be who had chosen not to learn their baby's gender via prenatal tests. The pregnant women were asked .to predict whether they were carrying a boy or girl based upon a "feeling," folklore, the way the preg- ancy was progressing, or even dreams. 71% of the women who forecast on the basis of a "feeling" or a dream were correct. More significantly, all pre- dictions based on dreams were on the mark.

> Researchers concluded that there is much about the maternal-fetal con- nection to be explored.

ReaHy!

(Anonymous; "Dreaming of Baby," Time p. 82, June 26, 2000.)

SLEEP-WORK AND DREAM-WORK

To dream an animal must sleep, and sleep is a dangerous state in the natural World. The animal is motionless, its senses are diminished; it is very vulnerable. Neither is there any provable bio- chemical valué to sleep. (See BHF31 in Humans II) Yet, a lar ge fraction of an animal's life is spent in this apparently useless and hazardous condition. Why, then, did sleep ever evolve?

But with sleep, come dreams, and maybe an answer is to be seen in them.

Cats establish long-term memorles during sleep. First, it is relevant that an ani- mal's brain (a cat's brain here) seems to be active even when an animal is sleeping deeply but not dreaming.

> It seems that during an extremely quiet phase of sleep, when researchers thought that nothing much was happening in the [cat's] brain, groups of cells in volved in the for- mation of new memories signal one another. The signáis, discovered only a few years ago, allow cells in many parts of the brain to form lasting links. Then, when a few cells are stimulated during waking hours, the links are activated and an entire memory is recalled.

Deep, dreamless sleep has long been thought to be of little valué to an animal. Apparently this is not the case. Deep sleep seems to be valuable in memory activation. Score one for sleep..

(Blakeslee, Sandra; "Researchers Link Deep Sleep to Memory RecaU," Austin American-Statesman, December 2000. Cr. D. Phelps.)

Rats rerun mazes in their dreams.

> Rats apparently can't escape the rat race, even when they're sound asleep.
> Research at the Massachusetts In- stitute of Technology say they have entered the dreams of rats and found them busily working their way through the same lab mazes they negotiate during the day.

The MIT maze-running rats were hooked up to equipment that recorded the neuron- firing patterns in the rats' hippocampus where memories are pro- cessed. The patterns were the same when the rats were dreaming and when running the maze during waking hours. From the patterns, it was even possible to teU exactly where a rat dreamed it was in the mazes.

Whether the rats worked out better maze Solutions in their dreams and thereby made their dreaming worth- while could not be determined from the article. Simple memory-review does not seem to have much survival valué.

(Anonymous; "Lab Rats Found to Dream of Mazes, Researchers Say," Baltimore Sun, January 25, 2001)

Humans conceptualize and créate while dreaming. A few anecdotes suggest that human dreaming may be innovative. The following three oft-told tales are truth- fully no more convincing to a scientist than many UFO anecdotes.

- When carbón atoms danced through the dreaming brain of A. Kekule, they led the waking Kekule to conceive the structure of the benzene molecule.

- O. Lowe awoke from a dream one night, jotted down a few notes, and fell back to sleep. On waking, he could not decipher his scrawl. Happily, the next night the dream recurred. Lowe raced to his lab, performed the experiment out- lined in his dream, and thereby de- veloped a new theory of brain activity.

- In 1869, D. Mendeleyev was puzzling over the disparate properties of the 63 elemente then known. Was there any pat- tern? One night he fell asleep and in a dream the elements feU into their proper places in the Periodic Table.

(Mazzarello, Paolo; "What Dreams May Come?" Nature, 408:523, 2000)

CommentB. These mammalian anecdotes involving sleep and dreams are amusing, but most dreams are frivolous, bizarre, and of very little practical valué, Mendeleyev notwithstanding. The utility of sleeping and dreaming do not seem at all eomraensurate with the accompanying vulnerability and the loss of waking hours.

However, speculation is fun. There are at least two rather far-fetched ex- planations for characteristics (sleeping and dreaming here) that do not appear to have very much survival valué.

- Sleeping and dreaming may be linked genetically to a characteristic that does have considerable survival valué. Example: Resistance to malaria is coupled to sickle-cell anemia.

•Sleeping and dreaming may represent unavoidable, intermedíate, evolutionary steps toward something of much greater valué. Example: those fea- thers on fossil dinosaurs; i.e., the protobirds.

Are sleeping and dreaming humane slouching toward Teilhard de Chardin's Omega Point or possibly A.C. Clarke's Childhood's End?

SLEEP AND SCIENTIFIC INSIGHT

Can scientific insights flash spontaneous- ly into one's mind during sleep and the accompanying dreams?

Many anecdotes favor a positive answer.

• .Friedrich Kekule "discovered" the ring structure of benzene while asleep.

•Otto Loew: "recognized" the principie of Chemical neurotransmissions.

•Elias Howe "invented" the 'sewing machine.

•Dmitri Mendeleev "conceived" the periodic table.

•Hermán Hilprecht "translated" the cuneiform writing on the Stone of Nebuchadnezzar.

A scientific study now seems to confina these widely popularized anecdotes. The report, appearing in Nature, first defines "insight" in scientific terms:

> Insight denotes a mental restructuring that leads to a sudden gain of explicit knowledge allowing qualitatively changed behavior.

The body of the report describes a clever experiment involving subjects transforming strings of digits into differ- ent strings. Subjects were given two simple rules to facilítate these trans- formations. However, there existed a third----undisclosed but cryptlc-------rule that greatly aecelerated the task.

Subjects that were allowed 8 hours of sleep before performing the pre-defined task discovered the "hidden" shortcut more often than the subjects used as Controls.

(Wagner, Ullrieh, et al; "Sleep Inspires Insight," Nature, 427:352, 2004. Maquet, Pierre, and Ruby, Perrine; "Insight and the Sleep Committee," Nature, 427:304, 2004)

Comment. We have no idea how the sleeping mind attacks the pre-defined problem---ñor how this talent evolved. Ñor can we escape the realization that the human mind may be capable of some still-unrecognized, perhaps not-yet- needed functions!

A DREAM INVENTION

We never thóught that Bell Labs would rely on a dream of one of its engineers to invent a new device!

In 1940, when Nazi armies were vietorious everywhere, D.B. Parkinson was designing a carded potentiometer for civilian telephones. One night, he dreamed he was on the Continent cióse to an Allied artillery piece. The remark- able thing about this gun was that every Shell it fired it nailed a Germán plañe. Parkinson expanded on this part of his dream:

> After three or four shots one of the men in the crew smiled at me and beckoned me to come closer to the gun. When I drew near he pointed to the exposed end of the left trun- nion. Mounted there was the control potentiometer of my level recorder. There was no mistaking it. It was the identical Ítem.

Bell Lab engineers quickly saw how Parkinson's potentiometer could be ap- plied to antiaircraft gun control. The M9 gun director was the practical result of Parkinson's dream,. In one week in August of 1944, the M9's were credited with destroying 89 of 91 V-l buzz bombs launched from the Antwerp area toward England.

(Schindler, George; "Dreaming of Vic- tory," New Scientist, p. 53, May 31, 1997)

Comment. Alert readers will have noted that the above anecdote contradicts the claim that dreams are always retrospec- tive.

WHAT DO BLIND PEOPLE DREAM?

Those who are born blind or become blind before the age of five do not see in their dreams. Nevertheless, their dreams are just as rich in narrative and detail as in sighted people. If one's sight is lost after the age of se ven, dreams will still brim with visual imagery. A grey area exists between five and seven years.

Interestingly, those rapid eye movements (REMs) signifying that a dream is in progrese do not occur, or occur very weakly, for those born blind or blinded before five.

How about congenitally deaf people? It appears that they may dream in sign language! Their dreams are also more colorful than those of people with normal hearing.

(Selsick, Hugh, and Baker, Fiona; "Dreamtime," New Scientist, p. 108, October 28, 2000)

WHY ARE DREAMS ALWAYS RETROSPECTIVE?

This question and others regarding dreams have been posed by two French researchers in a new book. One of our French readers has summarized some points made in this new book.

> Michel Jouvet, a French specialist of dreams, asks the question: Why do cosmonauts never dream about space? Why do they dream only about the Earth?
>
> According to psychologists, the "day residue" in dreams is rather important. Half of all dreams allude to events of the preceding day; 89% allude to events of the last 120 days. The older the event, the lower the odds that it will reappear during the night.
>
> When people wear colored glasses, they begin very quickly to dream in the same color. '■
>
> People who make a complete change of life; for example, by travelling to a faraway place; do not begin to dream about this new place for weeks or months.
>
> A Bassari from Senegal, who was resident in Paris for two extended stays, was asked to write down his dreams. Surprisingly, 88% of his dreams occurred’in Africa and only 6% in France.
>
> This experiment and others like it are discussed at length in the book, but explanations are lacking. Do we really understand anything about dreams?

(Jouvet, Michel, and Gessain, Monique; Le Grenier des Reves, Paris, 1997. Cr. C. Marecaille.)

HALLUCINATIONS

OVERVIEW

Visual images, voices, and all manner of physiological sensations that do not exist in an objective sense form that large group of mental phenomena collectively called "hallucinations." Scientific information about hallucinations comes almost entirely from personal testimony. This kind of knowledge is obviously highly subjective and cannot be tested for validity like the claims of telepathy and dowsing. The idiosyncrasies of human perception, the percipient's imagination, and outright fraud muddy the scientific waters here. Nevertheless, the immense numbers of reports describing hallucinations and illusions suggest that many people believe that they do see, hear, feel, taste, and otherwise sense nonexistent "things."

That some hallucinations are producís of the subconscious seems. certain. The hypnagogic illusions or "faces in the dark" that appear on the borderland between sleep and wakefulness probably fall into this category. Ghosts, religious visions, dopplegangers, psychic lights, and some UFOs may be joint products of suggestion and the subconscious. So may the images seen in crystal balls, which are in essence optical planchettes. People often see only what they want to see or only what their culture tells them they should see. Even scientists may report only those results they expect to find under prevailing paradigms. The human consciousness, it seems, is a rich lode of strange images which, like the outpourings of the automatic writer, are foreign or nonexistent to the normal conscious person.

Perhaps the biggest mystery in the study of hallucinations is that tendency of people in all cultures from all time periods to claim that they perceive the same sorts of hallucinations; that is, the same sorts of ghosts, religious figures, monsters, UFOs, etc. Why is the human mind made in this way? Did (or does) our susceptibility to hallucinations have survival valué? Will it be more useful in the future?

NDEs

ARE UFO ABDUCTIONS AKIN TO NDEs?

Hard-core UFO researchers will probably reject S.W. Twemlow's associating UFO abductions with NDEs (Near-Death Experiences). Here is an abstract of his 1994 paper published in the Journal of Near-Death Studies.

> **This article proposes an integrated psychodynamic perspective to account in part for a variety of similarities between near-death experiences and UFO abductions. The psychodynamic psychology of these experiences implies that their "realness" is mainly a function of that psychology, rather than primarily of an objectifiable ex- ternal reaüty. Clinical and research examples highlight the theoretical and practical usefulness of this model.**

(Twemlow, Stuart W.; "Misidentified Flying Objects? An Integrated Psychodynamic Perspective on Near-Death Experiences and UFO Abductions," Journal of Near-Death Studies, 12:205, 1994. As abstracted in: Exceptional Human Experiencia, 14:261, 1996)

Comments. If one prunes away the psychological verbiage, Twemlow seems to be saying that in the minds of the percipients, NDEs and UFO abduction experiences are pretty much the same; that is, both phenomena are mentid and not physical. However, in the same issue of the Journal of Near-Death Studies, K. Basterñeld asserts that physical evidence exists for UFO abductions but that there is none for NDEs! Apparently, an abductee has brought back a piece of a UFO or something like that. That's news to us, be we are not well-versed on these subjeets.

**A SKEPTIC'S NDE-------
NOT SO MYSTICAL**

NDEs (Near-Death Experiences) pro- foundly affect those who recover to describe them. Prominent in most NDEs is the perception of traveling down a long tunnel. Those with a religión or mystical turn believe that this tunnel opens up into an afterlife or perhaps a continued existenee on some other "plañe."

In a recent Skeptical Inquirer, L.D. Lansberry wrote *oí* her pesonal NDE. It happened during angioplasty, when her heart stopped temporarily. Lansberry, a confirmed skeptic in such mat- ters, has always maintained that the customary interpretations of NDEs are so much "tomfoolery." When she entered that famous NDE tunnel herself, she saw it cióse down around her as her heart stopped. Then, as the doctor brought her back, the tunnel opened up again and she saw a light at the tunnel's end, but it turned out to be only the light of the operating room.

Lansberry asserts that there is no- thing transcendental about the tunnel effect. She attributes the experience to the failure of neurotransmitters in the outer portion of her brain failing to fire, in effect creating a coUapsing tunnel in her mind. Fortunately, her doctor re- versed the effect. "When the tunnel closes," she wrote, "we are dead."

(Lansberry, Laura Darlene; "First-Per- son Report: A Skeptic's Near-Death Experience," Skeptical Inquirer, 18:431, 1994) ■

Comment. Perhaps Lansberry saw only what she wanted to see. Thát was heaver enough for her!

"PLANETARY VISIONS" DURING NDEs

It is difficult to move from the universe of hard objective faets into the shadowy world of Near-Death Experiences (NDEs). Nevertheless, NDEs have elements of consistency across a wide spectrum of percipients. Mainstream scientists always explain NDEs in reductionist terms: they are merely the consequence of physiological changes taking place in the dying person's brain. Parapsychologists are more open-minded. They wonder if being near death breaks down a barrier sepa- rating the everyday, objective world from a spiritual one. If their intuition is correct, there is the thought that, by breaching this barrier during NDEs, the percipients might transcend our usual confines of time and space. At these moments, "planetary visions" be- yond the moment might oecur; that is, prophecy!

Before chucking this issue of SF, "hard" scientists should recognize that the foregoing surmise can be tested, not aB rigorously as measuring the electron's charge, but stiU a test of sorts.

K. Ring has collected testimonies of these so-called "planetary visions" from individuáis who had been clinicaHy dead for more than 10 minutes, but who were subsequently revived (obviously!). Typical of Ring's collected testimonies was this from a 17-year-old NDE percip- ient:

> **I was informed that mankind was breaking the laws of .the universe**

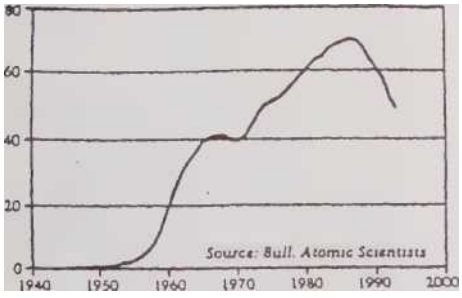
and as a result of thls would suffer. This suffering was not due to the vengeance of an indignant God but rather like the pain one might suffer as a result of. ..defying the law of gravity. It was to be an inevitable educational cleansing of the earth...

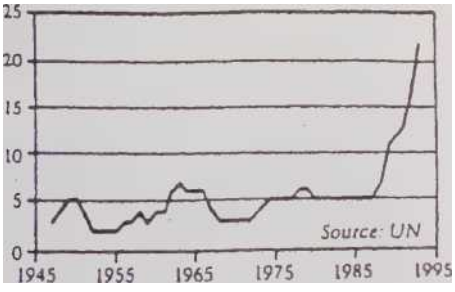
At the end of this general period of transition, mankind was to be "born anew" with a new sense of his [or her] place in the universe.

Surveying his colleetion of like testi- mony, Ring generalized:

Surprising commonalities in these visions predicted a rising tide of natural, economic, and political crises culminating around 1988. ünless human beings turned toward God, took better care of the planet and each other, an apocalyptic cleansing would occur, possibly including a nuclear war, followed by the long promised New Age.

1988 has passed and we are still here. Is there objective evidence that humans mended their ways and averted the promised "cleansing? A.S. Alschuler, the author of this provocative-paper thinks so, and he produces four graphs to prove his point. Each addresses a concern transmitted via people who experienced NDEs: (1) production of chlorofluorocarbons; (2) nuclear arsenal levels; (3) weapons exports; and (4) the number of peacekeeping. missions.
(We reproduce only two of Alschuler's graphs.) All four graphs show global "sea changes" commencing about 1988!
In other words, collective humanity did reform enough to avert disaster! But how were these atypical human actions initiated and organized? Alschuler suggests "collective psychokinesis."





• *fTop) Global nuclear arsenal in thou- sands of warheads. (Bottom) Number of peace-keeping missions.*

(Alschuler, Alfred S.; "When Prophecy Succeeds: Planetary Visions Near Death and Collective Psychokinesis," American Society for Psychical Research, Journal, 90:292, 1996.)

Comment. Alschuler evidently supposes that the Gulf War and massacres in Bos- and Africa are merely "ripples" following the 1988 "sea change"!

From all this, we have to recognize that human inquiry exists in many guises —and they are certainly not all alike in their approach to the unknown. NDEs and collective psychokinesis are just as valid concepts in parapsychology as electrons are in physics.

OBEs

DO OUT-OF-THE-BODY EXPERIENCES ORIGINATE IN THE BRAIN?

In the typical OBE (Out-of-the- Body Experience), one's conscious-ness seems to be detached from the body and one sees one's body from a distance. O. Blanke et al have demonstrated that OBEs can be in- dueed in a non-mystical way.

Here we describe the repeated induction of this experience by focal electrical stimulation of the brain's right angular gyrus in a patient who was undergoing evaluation for epilepsy treatment. Stimulation at this site aleo elicited illusory transformations of the patient's arm and leg...and whole-body displacement, indicating that out-o-the-body experiences may reflect a failure by the brain to intégrate complex somatosensory and vestibular information.

(Blanke, Olaf, et al; "Stimulating Illusory Own-Body Perceptions," Nature, 419:269, 2002.)

PHANTASMS

THE VIEW FROM WITHIN

A hypnotized individual can sometimes be coaxed to hallucinate his or her body image as seen by the unconscious minri. The hallueinated body image may be radically different from that con- ceivéd by the conscious mind. In cases of mental illness, the hallueinated unconscious body image may not even be a human figure but rather a bird, a flsh, or an inanimate object or geometric figure. The nature of the unconscious body image seems to depend upon the nature of the emotional pathology and may even be useful in diagnosis and treatment.

(Freytag, Fredericka; "The Hallueinated Unconscious Body Image," American Journal of Clinical Hypnosis, 7:209, 1965)

FONGAL PHANTASMS

Recently, it was seriously suggested that people see ghosts in haunted houses because they ingest spores broadeast by psychoactive fungi growing on the oíd walls! This amusing idea turas out to be an oíd one, having appeared in 1883 in the Gentleman's Magazine.

(Goodman, Arthur; "Ghost Potions," New Scientist, p. 54, July 8, 1995)

Comment. Seems like the skeptics are grasping for straws? Or should we say "ectoplasm?" ■

WHEN COMING EVENTS CAST PSYCHIC SHADOWS BEFORE THEM

In Norway, it is claimed that sometimes the arrival of a person is presaged by the distinct sounds of his or her arrival; i.e.; footsteps, doors opening, over- shoes discarded, etc. Such pre-arrival sounds are made by the "Vardtfgr"—a sort of psychic double that time-wise precedes the flesh-and-blood individual. ■ The same sounds are repeated when the real arrival occurs. Inquiries indicate that the Vardílgr appears when the tra- veler begins his or her journey, sometimes even earlier when the trip is con- ceived!

An exchange of letters on the Vardtfgr phenomenon in the Journal of Scientific Exploration provides several faseinating anecdotes. The Vard«Jgr, it seems, ıs taken for granted by many Norwegians.

These letters also touch upon other similar premonitory phenomena. Most of these other psychic phenomena, being anecdotal like the Vardtfgr itself, are poorly defined. One, however, has been thoroughly researched by R. Sheldrake in his book Dogs That Know When Their Owners Are Corning Home.

(Stillings, Dennis, and Leiter, L. David; "More on Vard«lgr," Journal of Scientific Exploration, 17:334, 2003.)

Comment. Could the dogs in Sheldrake's experimente be sensing the Vard<6gr, the psychic doubles of their owners; that is, their car noises, footsteps, etc.?

DELUSIONS

THE SOLAR WIND AND HALLUCINATIONS

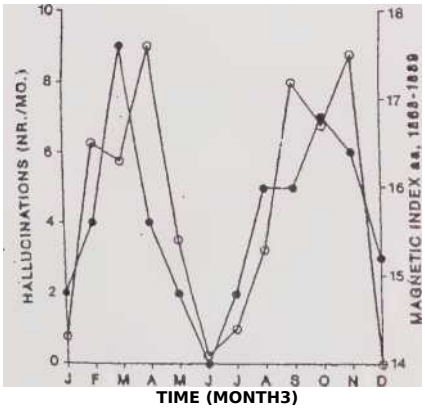
> Data from the 19th century on hallucinations and magnetic disturbances were found to exhibit a direct and statistically significant correlation. The aa magnetic índex over the period 1868-89 and concurrent visual hallucinatory activity were found to covary.. .Magnetic influences on the pineal hormone, melatonin, are sug- gested as a possible source of varia- tion.

W. and S. Randall, the authors of the foregoing abstract, are in the Department of Psychology at the University of Iowa, Iowa City. An obvious question: Where could they have found reliable data on hallucinatory events between 1868 and 1889? Answer: Phantasms of the Living, by those oíd stalwarts of psychieal research: E. Gurney, F.
Myers, and E. Podmore, as reprinted by University Books in 1962.

> Within these pages, every visual hallucination with the month of occurrence was used in the correlational analysis (a total of 49)...A11 the — visual hallucinations were of human or "huraanoid" forms, typically recog- nized as a dead or dying friend or relative.

(Randall, Walter, and Randall, Steffani; "The Solar Wind and Hallucinations-----
A Possible Relation Due to Magnetic Disturbances," Bioelectromagnetics, 12: 67, 1991. Cr. S. Jones.)

Comment. Bioelectromagnetics is one of the thousands of journals we have not explored. Someone else should get busy! However, we must point out that the 49 visual hallucinations represent a very small sample severely limited to only those experiences that happened to have been submitted to the English Society for Psychieal Research.



Frequency of hallucinations correlated time-wise with the solar-related magnetic índex.

TRISKAIDEKAPHOBIA AND QUATREPHOBIA

In Western countries, the number 13 is considered unlucky and a quantity to be avoided when possible. That is why some tall buildings "omit" the 13th. floor.
Such is a prime [!] example of triska-dekaphobia.

Perhaps the architects have reason to be wary because the latest frequency table for the British lottery has 13 at the bottom of the list. It was the least- lucky number. It was drawn only 65 times since the beginning of the lottery. Statistically, it should have popped up 88 times. This fairly large sample shows clearly that there is something sinister about 13.

(Brooke, Paul; "Unlucky 13," New Sei- entist, p. 54, December 1, 2001)

Comment. Why do they not tell us what the luckiest number was?

In China and Japan, the words for the number four and death are pronounced almost identically. The "fear of four" is so powerful that Chínese and Japanese deaths from heart disease rise sharply
on the fourth day of each month------even for those Chínese and Japanese living in the United States. Other Americans do not display this strange calendric effect.

To reduce the physiological effeets of "the fear of four," some Chínese and Japanese hospitals "omit" the fourth floor and rooms bearing that evil number.

There is no linguistic link to the number 13 in English, so we do not see any increase in cardiac deaths on the 13th. of each month for other Americans.

(Bower, B.; "For Some Heart Patients, Days Are Numbered," Science News, 161:7, 2002)

FOLIE A DEUX INVOLVING A DOG!

The term 'folie 'a deux" is used to describe an induced psychosis, it is usual- ly reserved for human-human interfaces. Folie a deux generally occurs when two or more people are very cióse emotion- ally. But some people living alone do develop cióse emotional bonds with their pets, and apparently, viee versa.

> Ms. A., an 83-year-old widow who had been alone for 15 years, com- plained that the occupant of an up- stairs fíat was excessively noisy and that he moved furniture around late at night to disturb her. O ver a period of 6 months, she developed de- lusionary persecutory ideas about this man. He wanted to frighten her from her home and had started to transmit "violet rays" through the ceiling to hax-m her and her 10-year-old female mongrel dog. Ms. A. attributed a sprained back and chest pains to the effect of the rays and had become concerned that her dog had started scratching at night when the ray activity was at its greatest. For protection, she had placed her mattress under the kitchen table and slept there at night. She constructed . what she called "an air raid shelter" for her dog from a small table and a pile of suitcases and insisted that the dog sleep in it. When I visited Ms. A. at her home, it was apparent that the dog's behavior had become so conditioned by that of its owner that upon hearing any sound from the fíat upstairs, such as a door closing, it would immediately go to the kitchen and enter the shelter.

(Howard, Robert; "Folie á Deux Invol- ving a Dog," American Journal of Psy- chiatry, 149:414, 1992)

ALIEN ABUCTIONS: WERE THEY, ARE THEY REAL?

J. Pontolillo, has generated a fascinating study of alien abductions, commencing with similar instances that occurred long before UFOs flashed across the sky. The long- history of supposed encounters with demons, witches, fairies, UFOnauts, and sundry fantastic creatures led Pontolillo to conclude:

> From the preceding examination of the phenomenon's many aspeets, it is apparent that alien abuctions are the continuation of an ancient, ongoing eyele of religio-mythie beliefs. The "seed events" consist of routine medical and gynecological procedures, hypnagogic and hypnopompie (sleep- related) imagery, and causativo traumas such as sexual assault. These events are then reconstructed in ac- eordance with historical and cultural precedences as weH as modified by modern-day media influences. The driving forcé behind this creation of abuction accounts lies in the exten- sive use of hypnotic recall in un-supervised investigations conducted by ETH [Extraterrestrial Hypothesis] proponents.

Pontolillo asserts that there is not a shred of evidence that alien abuctions have objective reality.

(Pontoillo, James; "Demons, Doctors, and Aliena," INFO Occasional Paper #2, March 1993. INFO = International Fortean Organization)

SORRY ROCES

> Things were good before I took some of Ayers Rock home, but since then my wife has had a stroke and things have worked out terribly for my children.

The above from an anonymous letter enclosing a chunk of red rock being returned to Uluru-Kata Tjuta National Park in central Australia. Near the Park, reddish, massive Ayers Rock pokes anomalously above fíat, barren country.
It is sacred to the aborigines and entrances the Western mind as weH.

Apparently, pieces of Ayers rock are cursed because thousands of chunks, now called "sorry rocks," have been returned to the Park by people glad to be rid of them.

No data offered concerning the valué of such contrition!

(Anonymous; New Scientist, D. 10. November 29, ”2003)

EXCEPTIONAL HUMAN EXPERIENCES

EXCEPTIONAL HUMAN EXPERIENCES

Surely everyone reading thls has had at least one experience that seemed to trans- cend the orderly ebb and flow of daily life. It's just as easy to be skeptical about these experiences-----to shrug them off----as it is to overvalue them.

There exists a unique organization dedicated to exploring this neglected body of phenomena lurking at the edges of normal human perceptlon and experience. It is ealled the Exeeptional Human Experience NetWork (EHEN). S.V. Brown, Director of R&D for the EHEN, has writ- ten a paper describing the mission of the Network. With her permission, we reproduce the paper's abstract.

> The Exeeptional Human Experience NetWork has a different approach to anomalous, out-of-the-ordinary Ex- ceptional Experiences (EEs). By taking the emphasis off proof, or artificially trying to "cause" or stage events in the laboratory, or passively collecting case reports, we are active- ly trying to understand what these types of experiences and the experi- encers are telling us as a whole. In- spection of the data indicates that there is a distinctive; recognizable patterning or elustering of inner and outer events: triggers, concommitants, and aftereffeets which are similar across experiencer reports from over 100 different types of EEs. Prelimi- nary study shows that those individuáis who begin to explore their EEs and question conventional answers may undergo a series of similar de- velopmental, predictable, humanizing, and transformative stages of expan- ding conscious awareness, which we cali the Exeeptional Human Experience Process (EHE Process). When EEers begin to comprehend and realize that their experiences are more than ex- ternal phenomena happening "outside" of them and instead signify a whole inner and outer personally meaningful experience, the EE becomes potenti- ated into an EHE. EHEers report greater numbers of EHEs including meaningful insights, heightened crea- tivity, and "lucky coincidences." Over time, or additional EEs/EHEs, or with a tremendous burst of insight, a subjective threshold is crossed. The experiencer’s lifeview and whole worldview changes, and a new per- spective (i.e., double visión) is forged. Fresh transpersonal connec- tions with a new visión of self and the world become established. In hind- sight, advanced EHEers report that the whole process was life-changing and somehow felt "destined." It is at this stage of the EHE Process where the EHEer has literally transcended everyday "normal reality" and dis- covered with elarity and quiet wisdom his or her unique "calling" in life, and the calling to an evolution of consciousness for all life.

(Brown, Suzanne V.; "Exeeptional Human Experiences: Rethinking Anomalies and Shifting Paradigms—-An Introduction and Background Paper," Exeeptional Human Experience, 15:21, no. 1, June 1997)

A FEW POTENTIAL EHEs

R.A. White, Founder/Director of the Exeeptional Human Experience Network (EHEN), has spread out a fascinating smorgasbord of some 200 potential EHEs. We have room for only a quick snack:

- Accelerating thinking
- Aesthetic experience
- Conversión
- Ecstasy
- Enlightenment
- Gaia consciousness
- Guru/holy-person encounter
- Hyperacuity
- Inspiration
- Intuition
- Lucid dreaming
- Lucky hunches
- Meaningful coincidences
- Peaee beyond understanding
- Peak performance
- Serendipity
- Soulmate experience
- Synchronicity
- World-Wide Web experience

(White, Rhea A.; "List of Potential Ex- eeptional Human Experiences," Exeeptional Human Experience, 15:41, no. 1, June 1997)

Comment. Hard-core reductionists may complain that the listed experiences are "fuzzy." But are they fuzzier than those "ghost universes" or the newly predicted "sterile" neutrinos?

MODELLING EXCEPTIONAL HUMAN EXPERIENCES (EHEs)

Just about everyone has had an EE (Exeeptional Experience): a transcendental insight, an out-of-body experience (OBE), a sudden religious conversión, a near-death experience (NDE), ecstasy, or similar "peak" experiences. Scores of such highly subjective phenomena have been deseribed and cata- loged in the psychological literature.
This vast body of anecdotal knowledge is still formless and deserves to be systematized and modelled in some way.

In this spirit, we reproduce below (with permission) the abstract of a long paper that presents a preliminary model of this realm of irregular., subjective, and often- vague phenomena. Hard scien- tists used to the quantitative definition of variables and reams of instrument readings will be entering a different world----a qualitative world. The language and concepts are so different. But, EEs and EHEs (Exeeptional Human Experiences) are so ubiquitous in human life that they should not be ignored. One supposes that they must have some meaning and evolutionary valué.

> The Exeeptional Human Experience (EHE) process is a unique, dynamic, Progressive, reiterative, evolving pattern of human consciousness de- velopment initiated by an anomalous experience and evidenced by expan- ding levels of reported inner and outer transpersonal awareness. This paper is based on a review of hun- dreds of experiencer first-person written narralives solicited by Rhea White and the EHE Network over the past decade. It presents an ortho- gonal expansión of our original 5-stage EHE process outline. The expended model highlights a 5-stage x 12-classifier matrix design, including 60 unique cells into which character- istics synthesized across and detailed within, experiencer narratives can be captured and mapped. The matrix model offers both a tool for research- ers, in the form of a classification grid, as well as a map of key fea- tures noted and synthesized across and within, each of the stages of the EHE process. The discussion fleshes out some of the key issues for each of the stages. In addition, the discussion speaks to the overarching processional interactions between stages with a focus toward furthering exploration, research and application.

(Brown, Suzanne V.; "The Exeeptional Human Experience Process: A Preliminary Model with Exploratory Map," Internation- al Journal of Parapsychology, 11:69, 2000)

Comment. How else can one systematize such an ephemeral, elusive, subjective body of observations?

EPIPHANIES AS VASCULAR ANOMALIES!

> Emanuel Swedenborg, the 18th cen- tury scientist and visionary, recalls Saúl of Tarsus. Each underwent a crisis of vocation and religious Outlook, and in both instances the criti- cal event was a single episode that could be characterized as eonvulsive. Saúl became the apostle Paul. His blinding conversión on the road to Damascus transformed the zealous advócate of Jewish tradition into the equólly persevering Christian prea- cher and martyr. Swedenborg's conversión occurred at age 56, in 1744, when he was troubled by dreams, heard strong winds, felt a powerful trembling, and was thrown from his bed. During the following weeks his sense of contrition and desire for righteousness approximated the spirit of penthos deseribed by orthodox contemplatives. Subsequently, he dis- covered his visionary ability to com- municate with spirits and devoted his remaining days to visiting the spirit world where he gathered information sufficient to establish a new religión and to write the several books com- posing the Arcana Coelestia.

After analyzing Swedenborg's visions and trance states, D.T. Bradford sug- gests that he only had had a "vascular anomaly in the posterior area of the left cerebral hemisphere."

(Bradford, David T.; "Neuropsychology of Swedenborg’s Visions," Perceptual and Motor Skills, 88:377, 1999)

Comment. Must we accept that all epi- phanies, revelations, and transcendental experiences are pathological? Strokes of genius will be next! Normality is very, very important.

OTHER VISIONS

MEASURING BEAÜTY

The Golden Ratio. On p. 311, we see how some of Mozart's eompositions are divided according the the Golden Ratio: 0.618. Even the ancient Greeks believed this ratio to be the secret of beauty in form and shape.. Our greatest painters, sculptors, and architects have employed the Golden Ratio intentionally or un- knowingly.

Realizing this august history of the Golden Ratio, it is surprising to learn that a test of 51 established artists and sculptors has cast doubt upon the whole business.

The subjects were asked to take a peneil and divide line segments into two parts such that they formed the most pleasing proportion. The ratio of choice was a disappointing 1:2 rather than 0.618!

(Macrosson, W.D.K., and Stewart, P.E.; "The Inclination of Artists to Partition Line Sections in the Golden Ratio," Perceptual and Motor Skills, 84:707, 1997)

Why Barbie Is Beautiful. A study of a long series of hominid fossils reveáis a Progressive loss of some physical attributes and the acquisition of other characteristics. One wonders why evolution has been remodeling the human form in what often seem to be nonadaptive ways. A curious, superficially frivolous test may offer some insights, some of which may be profound.

Drawings and photographs showing humans with various physical traits were prepared and shown to 495 subjects, who were asked to select the most attractive characteristics.

•In disfavor were: short shins, short legs, bowed lega, large and poin- ted canines, gums showing above' the teeth, short thumbs, long palms, eurved fingers, jutting jaws, short necks.
These are all primitive features still seen in apes and monkeys.

•Favored were: tallness, long legs, slim waists, long necks, eurved red lips, large eyes, square shoulders, straight teeth, straight fingers, smooth and hairless skin, nonsloping foreheads, fíat abdomens.
These are all features "derived" during evolutionary history.
A look at a photograph of a Barbie dolí, which accompanied the article, proves that Barbie epitomizes these favored characteristics.

Apparently, human males have been selecting their mates for these traits. The fossil record indieates this Barbie trend over millions of years. In effect, humans are selectively breeding them- selves with Barbie as a goal for women.

Interestingly, dolls with more of the primitive traits have never been able to compete with Barbie in the marketplace.

(Magro, Albert M.; "Why Barbie is Perceived as Beautiful," Perceptual and Motor Skills, 85:363, 1997)

Comments. The article did not mention bosoms or buttocks. Ñor were males considered. It follows, though, that men must be evolving in the direetion of Ken, Barbie[1] s well-known boy friend.

MEASDRING SPIRITUALITY!

The connection between matter and spirit has been debated for millennia. The central mystery is that eertain material objects (human beings) con- trive to be conscious and to possess a spiritual dimensión. This implies that matter itself has some rudimentary spiritual character.

From this opening paragraph, D. Jones advances his thesis by assuming that the spiritual world occupies the' same space as the material world. The two "worlds," though are usually only very weakly coupled. However, during the 12-billion- year history of the universe they have had ampie time to come into thermodynamic equilibrium. In other words the average temperatures of the material and spiritual worlds are equal; i.e., 3°K, the same as the microwave background.

It is, of course, this low average temperature of the spiritual world that accounts for the chill felt when a spiritual entity (ghost) enters a room and is coupled to the material world.

Continuing on this tack, Jones now plans to measure whether holy relies and other material objects with high spiritual valué cool faster than non-spiritual objects. He also hopes to work with bio- logical materials, specifically the human brain, which is the seat of consciousness and spiritual thought. Human brains, particularly those of holy men, should be tightly coupled to the coid spiritual world. These human brains should cool much faster than, say, a sirloin steak.

Speculating even further, Jones proposes to test semiconductors to determine whether they cool faster than ordinary minerals. If they do and since semiconductors form the brains of computers, it is reasonable to suppose that computers could eventually become conscious entities and perhaps even acquire a spiritual dimensión!

(Jones, David; "Spiritual Matters," Nature, 398:669, 1999)

Comment. It logically follows that the brains of atheists and those who scoff at things spiritual would cool more slowly than sirloin steak.

MIND-BODY PHENOMENA

OVERVIEW

The control of the mind over the body is more amenable to scientific study than most topics ¡n parapsychology. Psychosomatic medicine is, in fact, not usually considered part of parapsychology, although the mystery of placebo action is certainiy as strange as the forcé that drives the hand of the automatic writer or the ouija-board user. Perhaps the mechanisms behind all of these phenomena are related.

Everyone knows that mental attitude affects physical well-being; head- aches disappear as do other complaints when mental conditions improve. But the mind-body relationship is much deeper. Consider also the phenomena of faith healing, Voodoo death, hypnotic deafness, and the raising of stigmata and blisters through suggestion. The mind exerts powerful influences over many bodily functions. Anomalies exist because we know virtually nothing about hov/ the mind accomplished these things.

PLACEBO EFFECT

FAKE NEEDLES BUT REAL KNIVES

Tile effect of a patient's mind in medical procedures can be as powerful as drugs and real surgery. This is the well known placebo effect. But how can doctors differentiate between the healing power of the mind and that of Chemicals and scalpels? The logical thing to do is to fake the procedure with one group of patients and compare resulta with a second group that got the "real thing." Of course, ethical problemB come to the fore because doctors are. supposed to cure people and not to pretend to. The ethical dimensión is aecentuated when real knives are employed and real blood flows.

Our fírst Ítem is not invasive but interesting nonetheless.

Placebo acupuncture. Many physieians scoff at acupuncture. Placebo experimenta could prove its efficacy. To this end, special placebo needles llave been invented. Like the fake daggers used on the stage, the points are blunt and retractable. The acupuncture patient feels a pinprick and thinks he or she sees the needle penetrating the skin, . but it's all fakery.

At the University of Heidelberg, 52 people with rotator cuff tendinitis were split into two groups; 25 were punctured with real needles, the rest just thought they were. In this experiment, the first group showed much greater improvement than those treated with the fake needles. Reíd acupuncture was more powerful than the placebo effect.

Now if we can only figure out how real acupuncture works!

(Lawton, Graham; "Needle Match," New Scientist, p. 10, December 4, 1999)

Placebo surgery. Because of the ethical questions, placebo surgery went out of style 40 years ago. A revival is now underway.

One promising treatment for Parkinson's disease requires the drilling of holes in the patient's forehead and in- jecting fetal eells deeply in the brain. This is certainiy a far cry from the fake acupuncture needles!

One patient, who knew she was involved in a placebo experiment, was lightly sedated during the real drilling. After the holes were completed, she heard the surgeon ask for the fetal-cell implanta. Because of this, she was cer- tain she had received the complete procedure. Afterwards, she felt that her condition had definitely improved. But it was all a eharade. The doctor did not inserí the implante. Her symptoms soon returned. The placebo effect was only temporary.

However, some of the younger patients who did get the total procedure did receive permanent benefits. The doctors knew, therefore, that the procedure holds out some promise.

(Cohén, Philip; "All in the Mind," New Scientist, p. 18, August 7, 1999)

MIND OVER BLOOD

Humans generally do not appreciate the powerful role their minds exert upon the flow of blood in their bodies, especially that near the skin.

Although stigmata are roundly pooh-poohed by the skeptics of parapsychology, many convincing cases are on record where devout Christians exhibit bleeding palms in sympathy with the wounds Christ suffered in the Cross.

> **For example, in 1972 a young African-American Baptist girl living in Oakland, California, manifested the stigmata from the palm 'of the left hand two to six times daily during a three-week period preceding Easter Sunday. Physiological and psychological tests did not detect serious pathology, and cióse scru- tiny ruled out self-inflicted wounds. Her dreams frequently included bibli- cal events; in the week before her bleeding began, she had read a book and had watched a televisión movie about the Crucifixión.**

Sigmata are not confined to Christians. The battle wounds of Mohammed are said to have appeared on devout Moslem men.

The overwhelming majority of Christians do not experience stigmata, but some of them can be induced to produce the typical bleeding palma by hypnotic suggestion. Such is the power of the human mind.

(Krippner, Stanley; "Stigmatic Phenomena: An Alleged Case in Brazil," Journal of Scientific Exploration, 16:207, 2002)'

Comment. Those who doubt the power of the mind to control their blood flow need only ask what Controls their blood flow during sex! Of course, the mind sometimes needs to be aided by Viagra.

PHANTOM-LIMB EFFECT

SEEING IS FEELING

It's all done with mirrors! By properly positioning a mirror, an arm amputee can see the image o£ his flesh-and-blood limb appearing where his lost limb would normally be---in a sense visually resurrecting the lost limb. In this way, scien- tists can explore the effects of visión upon the multitude of very strange "phantom-limb" phenomena reported by amputees. V.S. Ramachandran et al have described some of their ñndings in N ature.

> Nine arm amputees were studied. A tall mirror was placed vertically on the table, perpendicular to the pati- ent's chest, so that he could 6ee the mirror reflection of his normal hand 'superimposed' on the phantom. In the flrst seven patients, when the normal hand was moved so that the phantom was visually perceived to move in the mirror, it was also 'felt' to move; that is, a vivid kinaesthetic sensation emerged. (These sensations could not be evoked with the eyes closed.) In patient D.S., kinaesthetic sensations were evoked even though he had not experienced movements in the phantom for the preceding 10 years.

Several patients that experienced pain in their phantom limbs (pain that can be excruciating) found that the pain disappeared when they could "see" their phantom limb in the mirror. Those who complained of the so-called "clenching spasms" in their phantom hands (compared to fingernails digging into the phantom) found the spasms eliminated upon "seeing" their phantom hands.

In some patients, touching the normal hand evoked toueh sensations at the same spot on the phantom hand. In others, though, the amputees felt no- thing unless the phantom hand was also seen to be "touched" simultaneously.

Even more curious, although the sensations of toueh and vibration can be "transferred" from real limbs to phantom limbs, the senses of pain, heat, and coid cannot!

(Ramachandran, V.S., et al; Touching the Phantom Limb," Nature, 377:489, 1995)

PHANTOMS OF THE BRAIN

In his review of a book with the above title (by V.S. Ramachandran and S. Blakeslee), D. Papineau repeats three irresistible anecdotes from the book. The people involved had either lost limbs or were partially paralyzed, so these three tales are at once sad, bizarre, and amusing.

The first two anecdotes involve amputees experiencing the phantom-limb phenomenon. The accepted explanation of this phenomenon is that the irritated stump of an amputee sends nerve mes- sages that deceive the brain into signaling that the limb is there after all. Ramachandran, a neurologist, has shown that this theory is incorrect. Instead, he asserts, when the area of the brain as- signed to the lost limb no longer re- ceives sensory input from the area, it begins to react to sensory input arriving at adjoining areas in the brain. In other words, the idle area "overhears" nearby signáis that are being processed and acts upon them in error.

This view explains why by simply stroking a man who had lost an arm, Ramachandran discovered two virtual hands in the man's face and shoulder. A toueh on the man's cheek brought the response, "You're touching my thumb."

The second anecdote is explained by the fact that the area in the sensory cor- tex assigned to the genitals is located next to that for the feet. Genital stimula- tion of people who have lost a foot trig- gers sensations in the phantom leg. One man had orgasms in his phantom leg as well as his genitals!

Lastly, there are those people who cannot recognize that they are paralyzed, say, on their left sides. Even when they obviously fail to pick up things with their left arms and cannot tie their shoes, they are emphatic that they are not paralyzed. Strangely and inexplicably, squir- ting water in the left ear brings them back to reality, but only temporarily.

(Papineau, David; "Banishing the Ghosts," New Scientist, p. 43, September 26, 1998)

TACTILE VENTRILOQUISM

An eerie psychological experiment has been invented by M. Bitvinick at the University of Pittsburgh.

(1) The subject rests his or her arm and hand on a table but is prevented from seeing them by a screen;

(2) A realistic rubber arm and hand are placed next to the real arm and hand but on the other side of the screen and in full view of the subject; and

(3) The experimenter strokes each hand in synchrony with small paint- brushes.

Result: The subject thinks that the rubber hand is his or her own and be- longs to his or her body.

(4) The experimenter strokes only the rubber hand.

Result: The subject claims his or her hand has become numb.

Botvinick terms this transfer of tactile sensations "tactile ventriloquism."

(Anonymous; "There's the Rub," Dis- cover, 19:21, June 1998)

Comment. Not reported in the article:

(5) Only the real hand is stroked.

Of course, the subject would see that the rubber hand, which is now thought to be his or her own, is not being stroked. Nevertheless, what would be the result, especially after a long session of synchronous stroking? What connection, if any, is there with phantom-limb phenomena?

PHANTOM BODIES

The phantom-limb phenomenon is well-known but poorly understood. A person who has lost a limb, or born without one, experiences pain, toueh, heat, and many of the other normal sensations in the absent appendage. How can this be?

Neuroscientist P. Brugger, at the University of Zurich, asserts the fol- lowing:

> The brain contains a representation of the body, and disturbanees in relevant neural networks by brain tumors or epilepsy can create the apparitions.

Brugger means that the brain seems to have a neurological map of the entire body, even if a person is born without a leg or loses same in an accident. The phantom-limb phenomenon is thereby ex- ■ panded to a "phantom-body" phenomenon. Continuing in this vein, tumors or those "neurological disturbanees" could also produce the sensation of an entire phantom body.

Could such whole-body apparitions be the source of the doppelgangers (images of one's self) that have been reported in the parapsychological literature and in folklore?

(Holden, Constanee, ed.; "Doppelgangers," Science, 291:429, 2001)

SLEIGHT OF HAND

In the now-famous "rubber-hand" experimenta, subjeets have their right hands hidden by a partition and see instead (via a mirror) a realistic duplicate hand made of rubber. When both real and fake hands are caressed simultaneously, the subject's mind identifies the rubber hand, which is in view, as the source of the stimulation. (above)

So convinced is the subject's mind of the reality of the fake hand that some surprising physiological phenomena can be lnduced. When one finger of the rubber hand is twisted, the subject "feels" the twisting sensation even though his real hand is not touched.

. A B and-Aid experiment shows even more convincingly how intímate the mind-body relationship is. Band Aids are stuck on both the real (hidden) and rubber hands plus the table holding the rubber hand. Then, both hands (real and rubber) and the table are stroked. When the Band Aid is ripped from the table only, many subjeets winced, some even reporting pain. Some displayed sharp changes in skin conductance in their real hands.

(Holden, Constanee, ed.; "Sleight of Hand," Science, 300:2029, 2003.)

Comment. Note, too, that some truly remarkable skin phenomena, such as the actual raising of blisters, can be ín- duced via hypnosis.

MIND-BODY MISCELLANY

WHY WE "ROLL IN THE AISLES"

Some of the research pursued by the Leiden Medical Center, Netherlands, was truly a laughing matter. G.J. Lam- mers and colleagues investigated the effeets of laughing upon the H-reflex that affects the soleus muscles in our calves. A decrease in the H-reflex is usually accompanied by a marked weakness in these muscles. They first showed slides---some funny, some not-------- to volunteers at 2-second intervals. Sure enough, when the subjects laughed, their H-reflexes nearly disappeared. Trying to quantify the phenomenon:

> The researchers then repeated the experiment with several new volunteers, but in this case they tried to make the subjects laugh by telling them jokes. When individuáis laughed at the jokes, their H-reflexes de- creased in amplitude by 89 percent------ significantly more than when the jokes merely made them smile.

(Anonymous; "Falling Down Laughing," BioScience, 49:940, 1999)

Comment. Presumably the subjects were firmly seated during all the hilarity. If they had been standing when their ealf muscles gave way, the lawsuits received by the Medical Center would not have been so funny!

Who said Science was no fun?

THE EFFECT OF NONCONTACT THERA- PEDTIC TOIJCH ON HEALING BATE

> The effect of Noncontact Therapeutie Touch (NCTT) on the rate of surgi- cal healing was examined in a double- blind study. Full-thickness dermal wounds were incised on the lateral deltoid región, using a skin punch biopsy instrument, on healthy subjects randomly assigned to treatment or control groups. Subjects were blinded both to group assignment and to the true nature of the active treatment modahty in order to control placebo and expectation effeets. Incisions were dressed with gas- permeable dressings, and wound sur- face areas were measured on Days, 0, 8, and 16 using a direct tracing method and digitization system.
>
> Active and control treatments were comprised of daily sessions of five minutes of exposure to a hidden Therapeutie Touch practitioner or to sham exposure.
>
> Results showed that treated sub- jects experienced a signiflcant accel- eration in the rate of wound healing as compared to non-treated subjects at day 8.

(Wirth, Daniel P.; "The Effect of Noncontact Therapeutie Touch on the Healing Rate of Full Thickness Dermal Wounds," Subtle Energies, 1:1, 1990. Quoted abstrae! text above taken from Exceptional Human Experience, 10:248, 1993. .

SOLAR RADIATION AND MENTAL ILLNESS

Following in the footsteps of the Dulls (1933) and Friedman et al (1953), three Israeli scientists have also found sur- prisingly high correlations between solar activity and psychiatric ülnesses.

> Numbers of first admissions per month for a single psychiatric unit, from 1977 to 1987, were examined for 1829 psychiatric inpatients to assess whether this measure was correlated with 10 parameters of geophysical activity. Four statistically significant valúes were 0.197 with level of solar radioflux at 2800 MHz in the corre- sponding month, -0.274 with sudden magnetic disturbances of the iono- sphere, -0.216 with the índex of geo- magnetic activity, and -0.262 with the number of hours of positive ioni- zation of the ionosphere in the cor- responding month. Percentages of variance accounted for were very sin all.

Quite understandably, these investi- gators concluded:

> How to interpret properly associa- tions of solar activity with human behaviour is yet impossible. The re- lative indifference of behavioral scientists to the question may reflect lack of an adequate theoretical frame- work relating to the question and the phenomenon.

(Reps, Avi, et al; "Geophysical Vari- ables and Behavior: LXIX. Solar Activity and Admission of Psychiatric Inpatients," Perceptual and Motor Skills, 74:449, 1992)

SONGS IN YODR HEAD

Aneurysms occur when the wall of a blood ves sel weakens and bulges out- ward. They can be very dangerous but in some cases they produce bizarre side effeets. Take, for example, this case of a 61-year-old woman.

> The woman's symptoms began with nausea, fatigue and then disorienta- tion. Then, after a year, she began hearing music in the forms of songs she knew. The music was peristent but kept changing.
>
> In December, it involved Christ- mas songs, for example. The songs were ones the woman learned when she was young.

She had no obvious physical prob- lems that might explain the hallucinations. The woman naturally went to a psychia- trist, but to no avail. Finally, repeated MRI examinations revealed two small brain aneurysms. When these were cor- rected surgically, the music stopped.

(Nagourney, Eric; "A Song in Your Head' Can Turn Deadly," New York Times, April 24, 2001. Cr. M. Piechota)

STROKE CHANGES ACCENT

> A Scottish woman went to bed with a headache and woke up speaking with a South African accent instead of her usual lilting Scottish brogue, a Bri- tish doctor said yesterday.
>
> Doctors say she had a minor stroke and suffers from foreign accent syndrome, a rare condition in which patients acquire a different accent after suffering a stroke.

(Anonymous; "A Rare Stroke Changes Accent," Baltimore Sun, October 14, 1997)

Comment. Assuming this Reuters dis- patch isn't pulling our legs, that's a pretty peculiar syndrome! The woman must have been previously exposed to the South African accent and incorpora- ted it in her memory.

SOME FUNNY THINGS HAPPENED ON THE WAY AROUND THE WORLD

Weird things happen in the weightless- ness of an orbiting spacecraft. In the many videos shot áboard the Space Shuttles, we are treated to tools, even gently oscillating globules of water, floating aimlessly in midair. Even stranger are the effeets of microgravity on humans and other life forms.

Astronauts, for example, when they first arrive in orbit, sometimes perceive their world to be upside-down regard- less of their orientation. Their nervous systems were apparently thrown for a loop when the forcé of gravity was cancelled out. These iUusions disappear later in the mission.

Speaking of loops, consider the medaka. This ñsh is the only vertébrate to have mated and laid eggs that developed into offspring in microgravity. Said offspring are doomed to lives of somersaulting swimming.

(Wassersug, Richard J.; "Life without Gravity," Nature, 401:758, 1999)

Comment. Could there be a connection to the nervous affliction of tumbler pigeons? See BBB8 in Biological Anoma- lies: Birds.

IF IT DOESN'T WORK, KICK IT!

> Vicki Wilmore, 10, from Gorton, Man- chester, was a happy child of normal ability until she complained of a head- ache one morning a year ago. From that moment, she started writing everything back to front and upside down.
>
> Although Vicki could read what she wrote, nobody else could and this caused her to cry with frustra- tion and led to classroom gibes. Several experts subjected her to psy- chological and physiological tests but failed to find a cure.

Then, after a troubled year, excited by a football game, Vicki jumped out of her seat, fell back, and bumped her head on a coffee table. The next day she went to school and was once more able to read and write normally.

(Jones, Tim; "Girl's Bump Cure's Mirror Writing," London Times, Deeember 7, 1995. Cr. A.C.A. Silk)

Comment. The sample of Vicki's "mirror writing" accompanying the Times article does not seem to be puré mirror writing, such as Leonardo da Vinci is said to have employed. It's more of a hodge-podge. Anyway a bump cured it------some-how mending a loose connection.

THE BIRTHDAY: LIFELINE OE DEADLINE?

The following abstract is from a paper in Psychosomatic Medicine:

> This study of deaths from natural causes examined adult mortality around the birthday for two samples, totalling 2,745,149 people. Women are more likely to die in the week following their birthdays than in any other week of the year. In addition, the frequency of female deaths dips below normal just before the birth—■ - day. The results do not seem to be due to seasonal fluctuations, misre- porting on the death certifícate, de- ferment of life-threatening surgery, or behavioral changes associated with the birthday. At present, the best available explanation of these ñndings is that females are able to prolong life briefly until they have reached a positive, symbolically meaningful oc- casion. Thus the birthday seems to function as a 'lifeline' for some fe- males. In contrast, male mortality peaks shortly before the birthday, suggesting that the birthday func- tions as a 'deadline' for males.

(Phillips. David P., et al; "The Birthday: Lifeline or Deadline?" Psychosomatic Medicine, 54:532, 1992)

HIDDEN KNOWLEDGE

OVERVIEW

Telepathy, precognition, dowsing, divination, etc., are now and always have been cornerstones of parapsychology. Since time immemorial, some individuáis have claimed that they could obtain information that was physically hidden, residing in the brains of others, or located in the füture. According to the tenets of Science, such data acquisition is impossible. Consequently, claims of telepathy, precognition, and the like
are always subjected to the closest scientific scrutiny——————even closer scrutiny than that accorded less extraordinary claims, such as the sigh ting of. a new species of mammal. As a matter of fact, reviews of some parapsychological experiments have led to many charges of fraud, sloppy science, and, in particular, poor statistical analysis. Moreover. it seems that almost every phenomenon of parapsychology can be düplicated by a good magician. Even today^ in the age of New Agers, we must face squarely the possibility that, marvelous though the human mind is, its capabilities may not embrace telepathy, dowsing, and other purported methods of acquiring information somehow hidden. Or, should these phenomena truly exist after al!, they are not powerful human traits.

ESP

GANZFELD EXPERIMENTS: DO THEY PROVE TELEPATHY EXISTS?

[Ganzfeld = total field]

In Ganzfeld telepathy experiments, the receiver's eyes are covered with halves of ping-pong balls and his ears disappear under huge earphones that soothe his auditory sense with white noise. In his padded cubiele, deprived of most sensa- tions, he drifts into a foggy blankness. After a quarter of an hour, the receiver begins to experience brilliant, dreamlike images---even without the benefit of a telepathic 'sender.' C. Honorton (now deceased) , the chief proponent of Ganzfeld experiments, believed that human telepathy, a very weak phenomenon at best, would be best detected during such sensory-deprivation experiments, in which extraneous sensory 'noise' was greatly reduced.

In actual Ganzfeld tests, the receiver and sender are placed in sepárate in- sulated cubicles. The sender is shown still photos and/or film clips. He tries to send these images, or the sense of them, to the receiver telepathically. In the best Ganzfeld experiments, photo and film clips are seleeted automatically and everything possible is computerized.

Because of the great care Honorton lavished on his experiments and his strong claims of positive results, we easily cannot ignore his work. In fact, Honorton designed his Ganzfeld experiments specifically to counter the eritics of parapsychology, who are numerous and vocal. If telepathic transmissions really do exist, they just might be dis cerned when the receiver's mind is open to the tiniest sensory cues.

Have the ubiquitous doubters been swayed by Honorton's experiments? Some critica of parapsychology, such as S. Blackmore, opine that Honorton has come up with best best evidenee yet for telepathy; but Blackmore still has her doubts. Already experimental flaws have been pointed out in Honorton's work. For example, the researchers scoring the experiments must be com- pletely ignorant of which film clips were used, but surreptitious peeks at the automated equipment were possible, and there could have been subliminal cues as to film-clip identities from the time periods required to rewind the tapes. Then, in the scoring conferences with the receivers, the scorers could have subconsciously led the receivers along.

So, the verdict still seems to be that telepathy is unproven. In fact, one wonders if a foolproof telepathy experi- ment is really possible at all.

(McCrone, John; "Roll Up for the Telepathy Test," New Scientist, p. 29, May 15, 1993)

Comment. One of Honorton's Ganzfeld discoveries was that strongly positive results occurred only with movie clips; still photos were 'transmitted' only at chance levels. Honorton attributed this to the richer imagery of action scenes. However, many other 'remóte-viewing' experimenters have claimed suceess with still photos! No wonder mainstream science is wary of the claims of parapsychology .

THE HEALING OF RENTS IN THE NATURAL ORDER

J. Beloff, a prominent researcher in parapsychology has penned a thought-provoking essay in the current Journal of the American Society for Psychical Research. The phenomenon that stimu- lated Beloff's articles was what he called the "decline effect." Parapsychology has ever been plagued by the appearances of seemingly robust psychic phenomena, such as Rhine's initial ESP experiments with Zener cards. These phenomena would excite parapsychologists for sever- al years, even decades, and then fade away. Writing in a historical vein, Beloff put it this way:

> **".. .it soon transpired that a decline effect, for ESP no less than for PK, could persist across sessions and, ultimately, across an entire career. Nearly all the. high-scorers eventually lost their ability. Even Pavel Ste- panck, whose 10-year career as an ESP subject earned him a mention in the Guinness Book of Records, even [1]**
>
> **tually ran out of steam. When, after a long break, he was retested recent- ly by Dr Kappers in Amsterdam, he could produce only chance scores. I do not think it was loss of motiva- tion or boredom in his case, as has sometimes been put forward as an explanation for the long-term decline effect, for.it was Stepanek's great strength that he was constitutionally incapable of ever being bored! Ñor can we take seriously Martin Gard- ner's attempt to explain how he might have relied throughout on trickery. If indeed he was a trick- ster, he should have steadily im- proved as he became more practiced. Whatever the explanation of these long-term declines, it must surely be something deep and pervasive."**

Further, it seems that while "strong" parapsychological phenomena declined rapidly, the "weak" parapsychological phenomena persisted. Here, Beloff cites

Further, it seems that while "strong" parapsychological phenomena declined rapidly, the "weak" parapsychological phenomena persisted. Here, Beloff cites as "weak" phenomena those measured by R. Jahn's Princeton gro.up, in which thousands of PK (psychokinesis) at- tempts consistently show small, but statistically significant positive effects over long periods of time.

Beloff sees two possible explanations for the decline effect:

(1) Each new strong parapsychological phenomenon consists only of a suc- cession of deceptions and blunders, which under severe scrutiny soon fades away—as with high ESP scorers using the venerable Zener cards. Beloff re- jects this skeptical interpretation be- cause of "its failure to offer any specific, plausible, normal counterexplanation to the various episodes that go to make up our history;" i.e., the long history of parapsychological research. [??]

(2) Instead, Beloff suggests that a paranormal phenomenon actually represents a "vlolation of the natural order." Nature, he says, reacts to these rents in the fahrie of the cosmos by healing them just as our bodles heal wounds.
The more robust the phenomenon, the more strenuously nature reacts, apparently almost completely ignoring the "weak" phenomena.

(Beloff, John; "Lessons of History," American Society for Psychical Research, Journal, 88:7, 1994)

Comment. We could add to Beloff's list of phenomena: DFOs, the Loch Ness monster, crop circles, coid fusión, infi- nite-dilution results, the fifth forcé, windshield pitting, aneient astronauts, and polywater, to ñame a few. We pre- diet that the scientific eommunity will not countenance these "violations" of natural order any more than it welcomed Sheldrake's morphogenic fields!

Gomment. Psi phenomena, assuming they exist, are difficult. to quantify. In addition, statistical correlations have many pitfalls ----------even with "robust" phe nomena!

CORRELATIONS OF BRAIN ACTIVITIES

In a series of Germán parapsychological experiments, pairs of individuáis were separated in rooms that were shielded from each other acoustically and electromagnetically. Six channels of EEG (electroeneephalograms) were recorded for each subject. One of the pair was allowed to relax and was shielded from stresses. The other member of the pair was visually stimulated by patterns on a TV screen.

> The [EEG] results indicate that correlations between brain activities of two separated subjects may occur, aí- though no biophysical mechanism is known.

(Wackermann, Jiri, et al; "Correlations between Brain Electrical Activities of Two Spatially Separated Human Subjects," Neuroscience Letters, 336:60, 2003. Cr. E. Bauer)

DOWSING

PSI PHENOMENA AND GEOMAGNETISM,- --

The item on solar wind and haliucina- tions on p. 274 brought varied responses. It seems that several psi phenomena have been correlated with geomagnetic activity or the lack of it. For example,
A. Gauld sent a copy of a long paper that he and H.P. Wilkinson wrote en- titled: "Geomagnetism and Anomalous Experiences." We have room for only a short section of their abstract:

> .. .in the end we were left with a residuum of positive findings: (a) There is a weak but persistent statistical relationship between lowish absolute levels of geomagnetic activity and the occurrence of spontaneous cases of apparent telepathy/clairvoyance. (b) There is a small ten- dency for the days on onset of cases of poltergeists and hauntings to be days of higher-than-usual geomagnetic activity. What underlies these ob- served relationship s remains to be determined.

Gauld noted in his letter of transmittal that the conclusions of Wilkinson and himself were at variance with the item on p. 274.

(Wilkinson, H.P., and Gauld, Alan; "Geomagnetism and Anomalous Experiences, 1868-1980," Society for Psychical Research, Proceedings, 57:275, 1993)

Another pertinent paper was presented at the 1994 meeting of the Society for Scientific Exploration in Austin. Employ- ing data collected at the Maimonides Dream Laboratory from a subject with apparently telepathic dreams, S. Krip- pner and M. Persinger determined that the accuracy of these telepathic dreams was enhaneed during periods of low geomagnetic activity. The subject’s psi scores were less accurate aB geomagnetic activity increased.

(Krippner, Stanley, and Persinger, Michael; "Enhancement of Accuracy of Telepathic Dreams during Periods of Decreased Geomagnetic Activity," Journal of Scientific Exploration, 8:4341 1994)

A MAJOR STDDY OF DOWSING

Most evidence for the efficacy of dow- sing is anecdotal. Most evidence for the inefficacy of dowsing comes from care- fully controlled field experiments, in- cluding such props as buried pipes with and without running water and other juicy targets for the dowser's wand. It is, therefore, somewhat surprising to find that a large study by physicists at the University of Munich supports the reality of dowsing. Here follows part of the abstract from a paper on this work:

> We report on the first major scientific program to tackle this intricate problem aiming for, at least, solid proof for either existence or non- existenee of the debated phenomenon. Within a period of two years some 100 dowsers have been tested by means of sophisticated experiments, designed and supervised by a very large team of scientists. A statistical analysis of the results revealed a very high level of significanee for the existence of a real dowsing phenomenon .
>
> Further geological experiments have been conducted, and are still going on, which aim at the looation of underground drinking water. The results turn out to be extremely positive. This leaves hardly any doubt that certain persons are capable of locating position-dependent anomalies by utilizing a new, still unknown mechanism. Various attempts will be described which explain how the reproducible phenomena could be dealt with. In particular, arguments will be discussed which speak in favor of the dominance of a eause- reaction model compared with ESP explanations.

(Betz, Hans D.; "Recent Results on Water Dowsing," Journal of Scientific Exploration, 8:436, 1994)

Comment. The abstract here is frustratingly vague. If the full report fulfiUs the promise of the abstract, we will have a major scientific coup.

UNCONVENTIONAL WATER DETECTION

Above, we introduced a short notiee about some apparently promising dowsing research being conducted by a group in Germany. A lengthy, comprehensive report of this research has been published in two issues of the Journal of Scientific Exploration. We now quote from that part of the abstract dealing with field experiments in several countries.

> This report presents new insights in- to an unconventional option of locating water reserves which relies on water dowsing. The effectiveness of the method is still highly disputed. Now, however, extensive field studies —in line with provable and reliable historie accounts----have shown that a few carefully selected dowsers are certainly able to detect faults, fis- sures and fractures with relative alacrity and surprising accuracy in areas with, say, crystalline or lime- stone bedrock. A series of Deutsche Gesellschaft fur Technische Zusam- menarbeit (GTZ) projeets involving this technique were carried out in dry zones with unexpectedly high rates of success. In particular, it was possible to lócate a large number of relatively- small underground aqui- fers in thinly populated areas and to drill wells at the sites where water is needed; the yields were low but sufficient for hand-pump operation throughout the year. Finding or locating a sufficient number of relatively small fracture zones using conventional techniques would have required a far greater work input.

A second part of the study involved controlled experiments in which dowsers tried to detect concealed targets such as pipes.

(Betz, Hans-Dieter; "Unconventional Water Detection Field Test of the Dowsing Techuique in Dry Zones," Journal of Scientific Exploration, 9:1 and 9; 159, 1995)

As one might expect (and should want),

dowsing skeptics reacted swiftly to the Germán work. As for the field studies mentioned in the above quotation, R. Hyman, a üniversity of Oregon psycho- logist and noted skeptic of things paranormal, stated that dowsing field tests are difficult to evalúate without good records on what proportion of local, nondivined wells produce good water. Apparently, wherever such records are available, as in Australia, the diviners do no better than the nondiviners.

The controlled experiments conducted by the GTZ have been criticized for their design. For example, blindfolded dowsers being escorted over pipes might well have received cues, perhaps in- voluntarily, from their escorts. (ESP experimenta have frequently suffered from this sort of defect.)

(Raloff, Janet; "Dowsing Expectations," Science News, 148:90, 1995) *1

SENS1NG PRESENCE

MORE SHELDRAKE HERESY

> In 20th century physics, the fací that the observer and the observed are linked is well established. In biology this is heresy. ,

Thus spake Rupert Sheldrake, and he is absolutely correct. He was refer- ring, of course, to that "spooky" pre- diction of quantum mechanics that the mere act of observing subatomic particles affects them. (See: !'A Watched Atom Is an Inhibited Atom" in vol.'I.) Sheldrake proposes extending the "observer effect" to biology. In effect, he suggests re- placing the state of an atom with the state of the neurological connections within the human brain. All this techni- cal jargon breaks down to a simple ques- tion: Can a per son tell if he or she is being stared at?

Before you leap ahead to the next Ítem, which we assure you is equaHy highly charged with controversy, con- sider that Sheldrake has conducted thou- sands of tests that do seem to show the reality of the observer effect in biology.

Sheldrake separates starer from staree by a glass window. The staree faces away from starer and is blindfolded. Prompted by a random-number generator, the starer stares or does not stare. The staree responde positively if he feels the starer's eyes locked on to the back of his head.

The starees are right more than 50% of the time. In fact, some starees are particularly sensitive to stares and re- spond correctly up to 90% of the time. Interestingly, even the best performers cannot teH when they are not being stared at! That's reasonable, if there is no signal, why should there be a re- sponse? Those scientists who have re- viewed Sheldrake's data agree that some sort of observer effect seems to be pre- sent.

Just what is the "signal" linking starer and staree? What kind of "forcé" can alter the neurological connections in the staree's brain, eliciting a positive reponse?

Sheldrake suggests that the act of staring generates a "field" similar to gravitation and other action-at-a-distance fields. When one thinks about it, aU such fields are "spooky;" Sheldrake's is no more so than the others.

(Anonymous; "Are You Looking at Me?" New Scientist, p. 39, July 26, 1997.)

Comments. Two questions come to mind:

(1) If some starees are especiaHy sensitive, are there also particularly powerful starers?

(2) Would viewing the staree via a mirror or closed-circuit TV make any difference?

EXPERIMENTAL INDÜCTION OF THE "SENSED PRESENCE"

Down the miUennia, a few individuáis in all cultures have claimed thév have been visited by spirits, gods, angels, or extraterrestrial entities. C.M. Cook and M.A. Persinger associate these visitations with the phenomenon of "sensed presenee" or the awareness of an extrapersonal, incorporeal entity. Cook and Persinger assert first that the so-caUed "sense of self" is a construct of the brain's left hemisphere---the side usually associated with language. Second, they hypothesize that a "sensed presenee" (spirit, god, etc.) is really only a fleeting right-brain homologue of the left-brain "sense of self," something like a transient short- circuit between brain hemispheres that probably travels along that interconnec- ting conduit called the "corpus caUosum."

Repairing to their laboratory at the Laurentian üniversity, Cook and Persinger asked subjeets to press a button when they felt a "mystical presenee." Unbeknownst to the subjeets, they were occasionaUy exposed to weak magnetic fields. More often than chance would allow, mystical presences (button pushes) correlated with applications of magnetic fields.

(Cook, C.M., and Persinger, M.A.; "Experimental Induetlon of the "Sensed Presenee" in Normal Subjeets and an Ex- ceptional Subject," Perceptual and Motor Skills, 85:683, 1997)

Comments. It is difficult to decide whe- ther sensing an unseen presenee is fun- damentaHy different from the sense of being stared at by a real person!

The implication of the above experi- ments is that magnetic fields can induce "mystical presences." Magnetic fields are everywhere; certainly around UFOs, probably around Stonehenge and the Oracle at Delphi. The explanatory possi- bilities here are endless.

ABILITY TO DETECT COVERT OB SERVATION

The above experimente by B. Sheldrake seemed to show that people could some- how sense when they were being stared at. One particularly sensitive individual was able to do this 90% of the time. But other experimenta say otherwise.

> A study was conducted to evalúate persons' purported ability to detect hidden observers. AnecdotaUy, most people (87%) report that covert obser- vation can be detected. A total of 140 coHege students individuaUy sat in a room with a two-way mirror and video- monitor camera. They were told that they might be observed for any or aU of the subsequent 5 min. Participante noted whether they felt a hidden observer watched them during each minute of the 5-min. session. After the session, students reported if a possible hidden observer watched via a two-way mirror or video camera or if they were not watched. Students were unable to detect observation be- yond chance.

(Rosenthal, Gary T., et al; "Ability to Detect Covert Observation," Perceptual and Motor Skills', 85:75, 1997)

ARE PETS PSYCHIC?

In 1994, R. Sheldrake chaUenged the world of Science with his book Seven Experiments That Could Change the World. One of the experiments he pro- posed was the objective testing of the claims that pets can somehow sense when their absent owners have begun the trip homward.

An Austrian televisión company de- cided to take up Sheldrake's gauntlet. Their experimental subjeets were P. Smart and her terrier Jaytee, both of Ramsbottom, England. Two film crews were dispatched to Ramsbottom; one to follow and film Smart, and the other, Jaytee's activities while Smart was away. Sure enough, at the moment Sharp and the shadowing TV crew decided to return, after an absence of a few hours, Jaytee ran to the porch and waited there until his mistress returned. NaturaUy, this proof of Jaytee's "strong and reüable" psychic ability received much attention in the media.

Then, in 1995, Sheldrake invited R. Wiseman and M. Smith, at the üniversity of Hertfordshire, to independently veri- fy Jaytee's talent. After aH, Austrian televisión companieS have little scientifie standing.

Wiseman and Smith conducted four experiments in aU based on a protocol designed to satisfy the inevitable scien- tific critics. For example, "success" had to be carefuUy defined, because Jaytee frequently ran out to the porch when other people, dogs, and cars went by the house, and sometimes for no obvious reason at aH. In addition, Wiseman and Smith had to be sure that Jaytee was not just responding to Smart's routine, and that there were no sensory cues from Smart (visual, acoustic, or smell) or from the observers left behind to monitor Jaytee who might know when Smart was expected to return. There were several other precautions including ran- dom selection of event timing.

As in many psi experiments, psychic effects disappeared when the severe protocole was applied. Jaytee failed four times to accurately detect when Smart began her homeward journey.

But what about the Austrian results? Wiseman and Smith requested copies of their footage for scientific evaluation. Eventually, they were informed that the tapes had been lost!

(Wiseman, Richard, and Smith, Matthew; "Can Animáis Detect When Their Owners Are Returning Home?" British Journal of Psychology, 89:453, 1998)

PSYCHOLOGY MISCELLANY

SORRAT

SORRAT = Society for Research in Rapport and Telekinesis.

Science Frontiers would be remiss if it did not at least mention the work of SORRAT.

SORRAT was founded by J.G. Nei- _ . hardt in 1961. Sittings similar to seances were held at Neihardt's home in Columbia, Missouri. The familiar table movements and other gross physieal phenoraena oc- curred. Another sort of psi experiment involved placing objects in a securely locked box. After a time, these objects were inspected and were found to be altered in some way! No wonder SORRAT experiments have been the subject of much derision and claims of fraud. Even the professional parapsyehologists seem embarras sed. But are there limits to psi phenomena? If telekinesis exista, as elaimed in the PEAR experiments at Princeton (p. 294), why not phenomena inside locked boxes? Or, perhaps, inside sealed letters consigned to the post?

In a recent issue of the Journal of Scientific Exploration, I. Grattan-Guinness recounted his involvement in a the SORRAT letter-writing experiments. Grattan-Guinness wrote questions on plain sheets of paper, sealed them care- fully in envelopes, writing across the seams, and applying sticky tape. These envelopes were self- addressed, postage applied, and sent in a larger envelope to SORRAT in Missouri. There, they were placed in a secure "isolation room." Three to five weeks later, the envelopes carne back to Grattan-Guinness in the regular mail. Many were posted at offices with colorful ñames, such as Carefree, AZ, and Deadwood, SD. After examining the envelopes for signs of tampering, Grattan-Guinness opened his mail. The enclosed sheets of paper contained answers to his questions.

Often the responses were vague----like those given by médiums and oracles. Occasionally, the envelopes contained extraneous objects, even sheets with questions posed by other SORRAT mem- bers during this extensive experiment.

Who provided the answers found in the returned letters: the communicators! Grattan-Guinness explained.

> The most positive and insistent responses from the communicators, apparently also to many other correspondents and even in response to questions which are not directly relevant, are fhat they are the surviving residues (ray word) of dead persona, and that they opérate independently of our restrictions of space and time. For example, "Remember that Our Side is vast in space, and outside physieal/temporal dimen- sions, and many are here!"

(Grattan-Guinness, I.; "Real Communication? Report on a SORRAT Letter- Writing Experiment," Journal of Scientific Exploration, 13:231, 1999)

Comment. We have summarized a 26-page report complete with photos, tables, etc., published in a peer-reviewed journal published by the Society for Scientific Exploration, which is composed mainly of diploma-holding scientists.

Of course, mainstream Science jour- nals wouldn't touch SORRAT with a 10- meter pole. SORRAT even stretches the envelope of most parapsyehologists a bit far. Nevertheless, it is only a short belief-step from a human mind affecting the motion of a pendulum to the "spirit messages" in the SORRAT envelopes. Where does one draw the boundaries of acceptable Science?

SLAMMING THE DOOR ON PARAPSYCHOLOGY-----AGAIN

An exchange of letters in the April issue of Physics Today demonstrates that an influential portion of mainstream Science (particularly physics) is firmly committed to reductionism and objectivism. Translation: this faction wants no part of parapsychology.

In the first letter, A.A. Berezin bravely proclaimed that science needs more ratlier than less research in parapsychology, citing specifically the work of H. Schmidt and R. Jahn. Further, he maintains that the major science jour- nals should be open to high quality research in parapsychology. He wrote-

> One cannot exorcise unorthodox claims by repeating mantras that they are "pseudoscience."

A second letter from S. Malin begins by noting that physics has undergone two major paradigm shifts during its history: (1) Aristotelian to Newtonian physics; and (2) Newtonian to contem- porary physics. Additional shifts are likely, and the next one might well in- volve the relation of consciousness to the physieal world. In support of his intuition, he quoted from E. Schroedin- ger's 1958 book Mind and Matter on the "principie of objectivation."

> "By this I mean what is also frequent- ly called the 'hypothesis of the real world' around us. I maintain that it amounts to a certain simplification which we adopt in order to master the infinitely intricate problem of nature. Without being aware of it and without being rigorously systematic about it, we exelude the Subject of Cognizance from the domain of nature that we en- deavor to understand. We step with our own per son back into the part of an onlooker who does not belong to the world, which by this very pro- cedure becomes an objective world. [Our] science... is based on objectivation, whereby it has cut itself off from an adequate understanding of the Subject of Cognizance, of the mind. But I do believe that this is precisely the point where our present way of thinking does need to be amended, perhaps by a bit of blood-transfusion from Eastern thought. This will not be easy, we must be aware of blunders-----blood-transfusion always needs great precaution to prevent clotting. We do not wish to lose the lógica! precisión that our scientific thought has reached, and that is unparalleled anywhere at any epoch."

The third letter is from J.R. Dowling, who expresses the belief of many physi- cists in matters parapsychological.

> For the most part, the results of relevant experiments undertaken over the last four decades have not proved to be reproducible by independent experimenters. Accordingly, I really do not see the valué of conducting yet more experiments.

Dowling feels that not only should parapsychological research be terminated but that the major physics journals should be closed to the subject.

(Berezin, Alexander A., et al; "More Spirited Debate on Physics, Parapsychology and Paradigma," Physics Today, 49: 15, April 1996)

Comment. "For the most part," Dowling says. If just one parapsychological phenomenon is reproducible, a paradigm shift must ensue. But that seems too horrible to contémplate!

INFORMATION PROCESSING

OVERVIEW

The mind of the normal individual processes 'Information in impressive but poorly. understood ways. The abnormal mind, or the normal mind in an altered State,, may be even more amazing in this regard. Indeed, some feats of memory and calculation are incredible. Calculation and memory prodigies (often called "savants"), for example, seem to rely upon faculties deep within the brain that may actually belong to everyone, if oniy we knew how to tap them. Another elusive mental capability is the apparent processing of information by the subconscious mind independently of the conscious mind.

Mathematical and musical genius are also fit subjects for this section. Where does this genius come from? Why do "strokes of genius" seem to explode unexpectedly from the subconscious? Why does genius seem to fade with maturity like the eidetic-image phenomenon? The fact that genius is often a companion of mental illness adds to- the puzzle.

Two phenomena of perception appear in the digests that follow: (1) "synethesia" or the automatic conversión of words and symbols into colors, sounds, or other sensory stimuli by a few individuáis; and (2) "perfect pitch" or the ability of a few to identify a tone in the absence of a refer- ence tone.

The existence of what we cali "consciousness" is an age-old puzzle— it is difficuit to even define this mental property. We cannot avoid or add materially to this subject here———————ñor, apparently, can most psycholo- gists in their journals!

It is popular to think of the human brain as the biological analog of the modern electronic Computer. The varied phenomena described below place this view in doubt.

CALCULATING PRODIGIES

CALCULATING PRODIGIES, GNATS, AND SMART WEAPONS

In a thought-provoking letter to New Scientist, J. Margolis commences with the observation that calculating prodigies (idiot savants), who are often also mentally retarded, can easily and almost instantaneously recognize 20-digit prime numbers! Gifted mathematicians with so-ealled photographic memories cannot per- form such mental feats using known methods for identifying primes. What do the calculating prodigies know that the rest of us do not? Better algorithms; that is, calculating methods? Margolis expands on this:

> **All this suggests some relatively simple, subconscious algorithms which have not, as yet, been explicitly for- mulated. Research in this direction might well result in new mathematical insights.**
>
> **It need not be surprising that mathematical insight is more funda- mental than language. Even a primi- tive animal brain is "wired" to per- form exceedingly complex computations essential for survival in an unpre- dictable environment. The latest "smart" weapons are rudimentary compared with a humble gnat. Mathe- matics could be a by-product of these functions. Language is a comparative- ly recent evolutionary innovation and it is quite possible that conscious manipulation of abstract symbols has not caught up with an innate ability to perceive quantitative relation- ships.**

(Margolis, Joel; "What Gnats Know," New Scientist, p. 58, January 30, 1993)

THE ÜNTAPPED HUMAN MIND

In 1994, J. Wilding and E. Valentine, both at the University of London, pro- vided the British Journal of Psychology with two studies of people claiming to have exceptional memories. In their second paper (Ref. 2), they detailed the mental workings of TM, a 25-year- old male, and an accomplished user of mnemonics. TM astounds audiences with his seemingly impossible memory feats. These feats, however, are no mystery to TM, and he has carefully explained how it is all mnemonics and nothing paranormal. But there remains the clear implication is that the normal human mind is underestimated and underused.

TM's "performances" involve six de- monstrations, two of which we now ela- bórate upon.

Demonstration 2. TM asks audiences for birthdates and very quickly gives the day of bírth. He has explained this "gift" thusly:

> **The day of birth calculations were originally carried out through use of a system of numerical codes for years and months which were com- bined and subjected to certain calculations. However, with practice many shortcuts and mnemonics have been developed and now TM often knows instantly that certain dates imply certain days, like learning the multi- plication table,.Every year and month has a code from 0 to 6 and TM has learned the codes (by the method explained below) for all years from 1900 to 2000. For any given date the method is to add the codes for the month and the year and divide the total by 7; the remainder gives the day of the week. For example, 27 October 1964 gives 27 + 1 (the code for October) + 3 (the code for 1964)**
> **= 31. Dividing by 7 gives a remainder of 3 which is the third day of the week, Tuesday. (Ref. 2)**

Note the connection between TM's feats and those of those idiot savants adept at calendar-calculating.

Demonstration 3. TM quickly gives the telephone number of any of the 15,000 hotels Usted in a large directory.

> **The telephone numbers have been learned through a mnemonic system for eneoding numbers as a series of two-digit pairs. Each pair has a learned associate (e.g. 00 is a bicy- cle, 57 is tomato sauce, 39 is Hitler, 41 is mum, his mother's age when he started this system). For larger numbers these associates are combined into wholes which are usually highly imageable (a bottle of tomato sauce riding a bicycle) and attached to some other associate to the hotel ñame. (Ref. 2)**

TM's mnemonics seem weird, but they work; and they probably could work for anyone—for we barely tax our mental powers in modern Ufe. But would our latent mental capabiüties been of use to ancient man, or is this stül another case of "evolutionary overshoot", as we harp on so heavily under BIOLOGY?

(Ref. 1. Wilding, John, and Valentine, EUzabeth; "Memory Champions," British Journal of Psychology, 85:231, 1994.
Ref. 2. Wilding, John, and Valentine, EUzabeth; "Mnemonic Wizardry with the Telephone Directory—But Stories Are Another Story," British Journal of Psychology, 85:501, 1994)

OÜR UNTAPPED TALENTS

Errol Kerr, an English lad of 3, has a photographic memory and can already count to 10 in five different languages. Even before he reached the age of 2, he could ñame every make of car he saw on the road.

(Anonymous; "Boy Has Genius Figured Out at 3," London Times, March 1, 1999. Cr. A.C.A. Silk.)

Comment. Kerr is certainly precocious and in him we see the glimmerings of eapabilities we may all have but cannot tap. Unlike so many "savants" and "cal- culating prodigies," Kerr is not deficient in "normal" human skills. He is just unusually smart. He has partially pene- trated a sort of barrier that seems to prevent most of us from drawing from a reservoir of remarkable mental capa- bilities. In savants and calculating prodigies, this barrier is ruptured and these talents flow readily to the fore— but usually at the cost of some "normal" talents.

Two Australian scientists, A. Snyder and J. Mitchel, have studied the "savant syndrome" and have presented their findings in the Proceedings of the Roya! Society (B266:587, 1999). The gist of their paper was reported by R. High- field in the Chicago Sun-Times.

> These savants are often autistic, a developmental disorder that leaves them with little ábility to empathize with others. However, some possess astonishing skills.
>
> He [Snyder] believes the ability to tap raw information—the mind's secret arithmetic---is possessed by mathematical savants. They can multi- ply, divide, factor and identify prime numbers of six and more digits in seconds, or identify the number of objects they can see at a single glance —111 matches scattered on the floor, in one case.

Snyder's intriguíng conclusión is that "...we believe that everyone has the underlying facility to perform lightning- fast integer arithmetic."

(Highñeld, Roger; "Study Adds Up to Formula for Math Genius," Chicago Sun- Times, March 23, 1999. Cr. J. Cieciel.)

A more technieal review of the Snyder-Mitchel Work has appeared in Nature. There, N. Birbaumer focussed on that mysterious barrier that supposedly prevenís most of us from utilizing our innate genius. Unfortunately, his ex- planations are a bit murky and jargony.

•We normal people cannot use our innate talents "because we process in- formation in a concept-driven way."

•Savants, however, can tap these eapabilities because of "a functional or pathological loss of executive brain centres."

In other words, the way we are programmed to think blocks or sup- presses access to our reservoir of mathematical talents.

In his review, Birbaumer adds that the work of Snyder and Mitchel is contra- dicted by studies of non-savant geniuses, and, especially, experiments in which ordinary people are trained intensively to match the mental performances of the savants.

(Birbaumer, Niels; "Rain Man's Revela- tions," Nature, 399:211, 1999)

Comment. Apparently, we can wear down that barrier separating us from genius by long, hard training------at least when it involves arithmetic skills. As Edison is reputed to have said, genius is 10% inspiration and 90% perspiration.

Or, possibly, we can program our "executive brain centers" better without compromising other eapabilities needed to prosper socially, such as that empathy lacking in savants.

(Clancy, Susan A., et al; "Memory Dis tortion in People Reporting Abduetion by Aliens," Journal of Abnormal Psychology, 111:455, ***IQÓZT)***

Comments. But what if the memory of _ just oni~of the abductees was accurate? It takes only one real abductee, one real UFO, and/or one real crop circle to change everything! It's that oíd un- explainable residue problem again.

In Science, it is easy to dispose of "events that are unlikely to have occurred ."

WORDLESS MEMORIES

In so-caüed "childhood amnesia," children who are perfectly normal cannot verbally describe very early events in their lives. The key word here is "verbaUy," because tests show that these young children— 2-3 years oíd-----can easily recall a year later how the simple mechanical games they once played with worked, but they still could not describe the games in words, even though they now had an vocabulary adequate to do so.

Psychologist H. Hayne concluded:

> The study demonstrates that you can't reach back to the nonverbally coded memories and describe them with words.

(Holden, Constance; "Wordless Memories," Science, 296:1233, 2002.)

Comment. It may be that the wordless- memory phenomenon sometimes applies to adults who witness bizarre events for which descriptive words do not exist. The result could be garbled, inaccurate reports or even word-amnesia regarding the event.

MEMORY PHENOMENA

MEGAMEMORIES

This is not about the latest ROMs and RAMs; it's about those few pounds of gray matter sitting atop your shoulders. Every once in a while we see hints of what it can really do.

At the age of eiglit, J. Von Neumann, the great mathematician, could just glance at a telephone book and afterward recite whole pages verbatim.

((Myhrvold, Nathan; "John Von Neumann: Computing's Coid Warrior," Time, 153: 150, March 29, 1999)

Recently, H. Goto, in something like 9 hours, recited from memory the first 42,0 digits of pi.

(Kaiser, Jocelyn; "Pieces of Pi," Science, 283:1975, 1999) --------

FALSE RECOVERED MEMORIES

Below is a quote from the abstract of a paper by a group of Harvard psycholo- gists.

> False memory creation was examined in people who reported having re- covered memories of traumatic events that are unlikely to have occurred: abduetion by space aliens. A variant of the Deese/Roediger-McDermott paradigm was used to examine false recall and false recognition in 3 groups: (1) people reporting reco- vered memories of alien abduetion; (2) people who believe that they were abdueted by aliens but have no memories; and (3) people who deny having been abdueted by aliens. Those reporting recovered and re- pressed memories of alien abduetion were more prone than control participante to exhibít false recall and recognition.

MALLEABLE MEMORIES

The ease with which psychologists can plant false memories in the minds of their subjeets-----even sawy college stu- dents----casts clouds over several anoma- lous phenomena, such as UFO abductions, ball lightning, and sea-monster sightings. Even scientists can be deluded into be- lie ving they have seen things in their laboratories. (Remember Blondlot's ex- periments with N-rays and the several physicists who confirmed his results?) Not that psychologists go around inten- tionaliy implanting memories of dubious phenomena. All it takes are suggestion, expeetation, and/or paradigm-passion.

At a 1997 meeting of the American Association for the Advancement of Science, several psychologists told of their "malleable-memory" experiments. H. L. Roediger III, Washington University, asked students:

> ...to look at a list of 15 words that included "bed," "dream," "blanket," "doze," and "pülow." Just over half said afterward that the word "sleep" had been on the list, even though it wasn't.

_ B• Loftus, University of Washington, first asked a group of parents to describe some events that their chüdren— all now adults----had experienced. Then, she went to the children and:

writers and non -writers are large.

Diagnosis	Writers	Non-writers
Depression	56%	14%
Mania	19	3
Panic attacks	22	5
Eating disorders	12	2
Drug abuse	17	5
Childhood sexual abuse	39	12

It seems that Dryden. back in tlie 17th century, was correct when he wrote: "Great Wits are sure to Madness near ally'd."

(Anonymous; "Madness and Creativity Revisited," Science, 266: 1483, 1994)

UNTAPPED TALENTS

DOES THE HUMAN BRAIN COMPUTE, OR DOES IT DO MORE?

Of eourse, the human brain can add and subtract, but does it perform aU of its functions by manipulating ls and Os, as a PC does?

The recent confrontation between G.K. Kasparov, boasting two hemi- spheres of gray matter, and IBM's Deep Blue ehess-playing Computer, with its boards of Silicon chips, suggests that the human brain may do things somewhat differently. Consider that in the 3 minutes allotted for each move, Deep Blue could evalúate 20 billion moves. This means that it could examine every possible move and countermove for twelve sequences ahead and, in addition, selec- ted lines of attack for 30 sequences. Kasparov was obviously doing no such computation. Yet, he won two, drew two, and lost only one game. IBM's A.J.
Hoane, Jr., remarked that chess geni- uses like Kasparov "are doing some mys- terious computation we can't figure out."

Hoane's use of the words "mysterious computation" tells us that he is a re-ductionist. The implication is that every-thing mental can be reduced to manipu-lating those ls and Os. In reality, Kas-parov's brain may have been innovating, working out new strategies, discerning Big Blue's weaknesses. These "higher- level" functions are needed when the problem (chess) is too complex for a Computer to evalúate all possible moves.
(A Computer can always win or draw at checkers—a simpler game.) Of eourse, we do not know how "higher-level" functions are "mechanized"----------perhaps they are not, and there is "something else" going on in the human brain.

Another interesting fact, incidental to the Kasparov match, is that Big Blue. Blue, when faced with identical chess boards, wlll sometimes make different moves! Maybe even Big Blue's behavior is nót always reducible to ls and Os.

(Horgan, John; "Plotting the Next Move." Scientific American, 274:16, May 1996)

UNLOCKING HIDDEN TALENTS

Dementia is a devastating illness. The brain deteriorates slowly. Sometimes, though, it seems like the illness strips away barriers and reveáis hidden or suppressed talents, as seen in the two dementia patients described below.

> One 53-year-old man, a car stereo installer with a lOth-grade education and no prior interest in art, suddenly began painting. At first, he drew simple still lifes of vases and bridges. But his Work became increasingly sophisticated. Eventually, he was painting Indians, churehes and haci-endas recalled from distant memories of his youth.
>
> Similarly, a 51-year-old housewife who had never had artistic training took up painting. She initially created unsophisticated images of rivers, ponds and rural settings; later, elabórate and sometimes eccentric ver- sions of the works of great masters.

Unfortunately, such new-found talents are short-lived. They, too, deteriórate.

(Stein, Rob; "Patients' New Gift Paints Clearer Image of Disease," The Brain in the News, p. 7, October 30, 1998. Cr.
J. Cieciel.)

Comment. This peeling away of mental barriers suggests that we all have hidden or suppressed capabilities. Perhaps, some day, we will know how to unlock these in normal people. It is pertinent here that in idiot savants these mental barriers are also somehow removed to expose remarkable mathematical talents, such as calendar calculating.

OUR FILTERED BRAINS

Beneath the thin bone of your cranium lies an organic information processor of prodigious speed and capacity. We see brief glimpses of its real power in the mental performances of those autistic savants who can tell us instantly the day of the week for January 1, 2022, [Saturday] or draw fantastically de- tailed and aecurate sketches of scenes after just a brief glance. You may scoff, but you could do the same if your con- sciousness didn't suppress your innate mental talents.

There is growing suspicion that our brains process and store just about everything our senses convey to them. Our brain is also a uumber-cruncher of great power that can "see" calendar pages stretching millennia into the future and far back into prehistory.
The most formidible arithmetic problems are child's play to it.

Some researchers maintain that it is our consciousness that prevenís us from realizing the full potential of this spongy sack of neurons. Consciousness, you see, is a necessary filter that per- mits only useful, practical information to flash before us as we attempt to deal with the real world. Of what survival valué is calendar-calculating in today's world when we have our PCs? Of even yesterday's threat-filled world? (Future worlds? Who knows?)

The consciousness filter is only partially effective in autistic savants. It is a bit porous in normal childhood, when streaks of genius sometimes seep through. Some normal children possess the power to reproduce in great detail complex scenes seen only briefly. (This is "eidetic imagery.") Such talents ebb away with age as adult life thickens the consciousness filter. Yet, cracks may persist in a few adults with photo-graphie memories and musical genius.

The consciousness filter can be eroded by intense training. In fact, calendar-calculating and eidetic imagery can be cultivated to recover, in effect, those suppressed childhood talents!

(Cárter, Rita; "Tune in, Turn off," New Scientist, p. 30, October 9, 1999. Sutton, Jon; "You Can Do It," New Scientist, p. 15, November 6, 1999)

Comments. Our brains seem to possess much more power than required in - today's world, and yesterday's, too.
We ask (facetiously and iconoclastically) whether our brains are examples of evolutionary "preadaptation"; that is, something we will need in the future!

It is also pertinent that humans are "neotenous." We possess many physio-logical features that are unspecialized — slates not yet written upon. In con- trast, the other "great apes" are much more speeialized. See BHA10 in our catalog Biological Anomalies: Humans I.

THE NUMBER MODULE

B. Butterworth, author of the new book The Mathematical Brain, proposes that your brain boasts a tiny module of cells----just over your left ear-------that endows you with a sense of number. These cells allow you, for example, to grasp instantly "fourness," say the number of corners on a square with out counting them one-by-one. Unfortunately, this capability usually does not exceed fiveness. If there were 10 people on a córner, you would have to count them individually if you are normal.

But some people are abnormal. Take, for example, the savant who could tell at a glance that 111 matches littered the floor without counting each individually. He grasped 111-ness! At the other end of the scale, Signora Gaddi cannot even distinguish that 20 is greater then 10.
She cannot use the telephone or catch numbered busses. Facts involving num- bers above four are a mystery to her. Even when there are four or fewer objeets, she must count them one-by- one. Nevertheless, Gaddi's intelligence and social skills are normal. She lost her number-sawy when she suffered a stroke that apparently short-circuited that number module over her ear.

Are other mammals equipped with number modules? No one knows. And what forces encouraged the human brain to sprout a few extra cells on the inferior parietal lobule;. that is, the number module? Did the sense of fiveness give some mutant ancient humans superiority over less-evolved humans? Finally, what factors pushed the number module's capacity to 111 in that savant, or is the savant's talent intrin- sic to all of us but somehow suppressed?

(Dahaene, Stanislas; "Counting on Our Brains," Nature, 401:114, 1999. Motluk, Alison; "True Grit," New Scientist, p. 46, July 3, 1999)

THE ECLIPSING OF INNATE TALENTS

The age effect. An idea going the rounds holds that everyone is really a genius but that his or her innate talents have been eclipsed or suppressed. Age is one factor that is blamed. As a child develops, so goes the theory, its brain is bit by bit swamped by the high-level conceptual thinking required for survival in the modern adult World. The child's innate raathematical genius, musical eapabilities, and other "low- level" talents are placed on the brain's back burner by the demands of adult- hood.

It is a common observation that the young assimilate foreign languages more readily than adults. A less-well-known talent, eidetic imagery (the ability to recall images with photographic precisión) , is found in some children, but it also usually fades with age. Now, we learn that 8-month-old babies are ap- parently blessed with perfect pitch, a capability they, too, generally lose as they age.

(Hall, Cari T.; "Learning by Infants Isn't Just Baby Talk,'¹ The Brain, Feb- ruary 28, 2001. Cr. J. Cieciel.)

Removal of mental blocks. Sometimes the barriers that eclipse our innate talents are removed by mental disease. The sur- prising enhancing effect of dementia on sbme "low-level" talents was mentioned on p. 288.

The same mental barriers also seem to be removed when transcranial mag- netic stimulation (TMS) is applied to that part of the brain that seems to be damaged in idiot savants. This is sug- gested by experiments in Australia by R. Young and M. Ridding. Applying TMS to the appropriate portion of the brains of normal, adult volunteers, they found that, indeed, their "low-level" calendar-ealculating skills improved as did their abilities to copy pictures from memory (as in eidetic imagery?).

(Nowak, Rachel; "Realise Your Potential," New Scientist, p. 7, March 17, 2001)

BORN TO ENUMERATE

Einstein once said in connection with his celebrated mathematical insights:

> Words and language.. .do not seem to play any part in my thought pro- cesses.

A French scientist, S. Dehaene, Bees in this declaration support for his claim that human brains possess a "number sense" that is independent of language and symbols, including even the numeráis we use in arithmetic! The numeráis, says Dehaene, are needed only in "exact arithmetic," which is a cultural invention and unrelated to the "number sense." Exact arithmetic, in fact, is an activity of our left brain where language is processed. Our general number sense, though, is sited elsewhere; the parietal lobe, to be speciñc.

Dehaene's experiments with babies demónstrate that, even before they can speak or do exact arithmetic, they can do "approximate arithmetic"; that is, they can distinguish between these two sequences of tones:

> beep-beep, beep-beep, beep-beep beep-beep, beep-beep, beep-beep-beep

This number sense is apparently hard- wired in a specifíc part of the human brain and the brains of a few other animáis that have been tested (monkeys and rats).

(Balter, Michael; "What Makes the Mind Dance and Count?" Science, 292:1635, 2001)

Comment. SuperficiaUy, distinguishing between strings of beeps would appear to be a trivial phenomenon. Not so!

The general number sense defined by Dehaene would seem to have significant survival valué, say, as in assessing threats or hunting opportunities. We can, therefore, conceive a neo-Darwinian evolutionary scenario here. But when it comes to the number sense at Einstein's level, we fail to detect any survival valué in the ability to develop the ab- struse equations of relativity until, say, the advent of tenured positions in uni- versities.

UNCONSCIOUSNESS AND ITS "ZOMBIE AGENTS"

We all harbor so-called "zombie agents" that rapidly and automatically perform actions without our conscious mind being aware of the stimulus and physical re- sponse. Normal people see this in dancing and fencing. Extreme examples in- clude sleepwalkers who can even drive cars and carry out other complex actions without remembering what they have done! Of course, sleepwalking is not a normal condition; nevertheless, rigorous experiments demónstrate that normal people will respond to scary pictures of snakes and spiders even though they are not conseiously aware of them.

Zombie agents are eharaeterized as on-line systems that act at speeds that far outpace conscious reactions. Since the zombie agents of unconsciousness work so well, why did consciousness ever evolve. Conscious actions take milliseconds longer to calcúlate and actívate. This would seem to be a bad evolutionary gambit.

But, C. Koch and F. Crick may have an answer:

> It may be because consciousness al- lows the system to plan future actions, opening up a potentially infinite be- ha vioural repertoire and making ex- plicit memory possible.

(Koch, Christof, and Crick, Francis; "The Zombie Within," Nature, 411:893, 2001)

Questions. Could our zombie agents, primitive though they may be, be the source of those flashes of genius that appear out of nowhere, or perhaps that "dreamwork" from which Solutions to problems appear fully formed upon wakening?

The quotation from the N ature article presumes that consciousness does have survival valué, else it would not have evolved. What sort of highly innovative genetic changes would lead to such a remarkable brain function? Did con- sciousness evolve in small Darwinian steps or in some grand, lucky mutation? Did any nonhuman animáis progress be- yond their assemblage of zombie agents?

NATURAL-BORN ReAdErS

The point of annoying the reader with a word of mixed cases and fonts is to demónstrate that humans readily recog- nize a word even if it displays gross irregularities. In fact, it is easy to be- come quite proficient at reading text that is upside-down or in mirror-image form. Some persons are expert anagram solvers. Actually, though, the simple act of reading straight-forward, untam- pered-with text is remarkable enough.
One has to wonder how this human pro-ficiency at reading ever evolved when it would seem to have had no survival valué even as little as 10,000 years ago.

Stanislas Dehaene has defined the anomaly nicely.

> Reading presents a real paradox to neurobiologists. It was only invented a few thousand years ago, so there really has not been enough time for our brain to evolve specialised ways to do it. How do brain circuits pro- duced by millions of years of evolu- tion in a world without written words adapt to the speciflc challenges of reading?

(Dehaene, Stanislas; "Natural Born Readers," New Scientist, p. 30, July 5, 2003.)

Comment. We may have here what the biologists like to cali "preadaptation." Or, perhaps the relevant brain circuitry was evolved for another purpose and just happens to also be useful in reading!

Of course, Dehaene may underestimate the speed with which the brain can re-configure itself or add new "programming."

A STRANGE PROPERTY OF HYPERLEXIA

Hyperlexia is the opposite of the reading disorder called dyslexia. Children af- flicted with hyperlexia, like those with dyslexia, have problems with oral com- munication and social interactions. But their reading abilities are truly anoma- lous.

> It's been reported that some hyper- lexic children can read at 18 months. Some start reading two years before they say their first word. Ethan, the child in the Georgetown University case study, reads six to eight years in advance of his age.

(Anonymous; "New Picture of Rare Child-hood Disorder," HealthDayNews, January 7, 2004. A web site. See also: www. hyperlexia.org/. Cr. H.H. Henry)

Comments and questions. To be able to read before speaking is truly an extra- ordinary ability. How can one determine whether the hyperlexic child is reading accurately? Can these children also read other languages as easily?

IS INTELLIGENCE A DEADLY PATHOGEN?

A recent letter in Nature reinforces our comment on p. 159 concerning the threat humans pose to the workings of Gaia. (The Gaia Hypothesis asserts that the biosphere acts in ways that maintain

environmental conditions favorable to the existence of life.) In his letter, A. Longhurst wonders whether the earth's biosphere acting as a whole-----Gaia-fashion---may have erred in creating an environment conducive to the evolution of intelligenee. It is is not olear, he says, that the sentient part of the biosphere (meaning "us") can develop enough self-control to reverse global warming, pollution, etc. He concludes as follows:

> In short, is intelligenee a pathogen to which the biosphere can adjust, or is it terminal? Perhaps it is as well that we cannot yet observe other habitable planets, to discover what became of their sentient life.

(Longhurst, Alan; "Too Intelligent for Our Own Good," Nature, 395:9, 1998)

SYNESTHES1A

THE SODND OF SHAPES

The ability of some humans to determine the pitch of a musical note in the ab- sence of a reference note ("perfect pitch") has been a favorite topic in Science Frontiers (see later discus- sions). It now seems that the human ear- brain combination can also discern the shapes and dimensions of thin, vibrating plates by the sound they make.

In one type of experiment, conducted by A.J. Kunkler-Peek (Brandéis Uni- versity) and M.T. Turvey (University of Connecticut), subjeets gave surprisingly accurate estimates of the heights and widths of three different vibrating plates. The plates were concealed behind a screen, but the subjeets could remotely control a striker. In further experiments, other subjeets could distinguish between the sounds of circular, rectangular, and triangular plates.

(Anonymous; "Listen to the Shapes," Science News, 157:171, 2000)

Comment. We all know from experience that small, thin plates produce higher pitched sounds than larger plates. How- ever, the ability to assign accurate di- mensions without some training is sur- prising. The same can be said for the Identification of shapes. Who, for ex- ample, has been exposed to vibrating, triangular-shaped plates in ordinary life? Could we be dealing here with another innate talent that, like perfect pitch, seems to have no adaptive valué in the evolution of humans?

THE PRESSORES OF MUSIO

Most of us experience the pleasures of music via our ears; i.e.; through our sense of sound. In the strange World of those afilióted with synesthesia, though, B-flat is experienced as the color green, and A-sharp is yellow, and so forth up and down the musical scale. One would expect that a symphony would bring a rioc of colors to anyone with synethesia. Aetually, rather than colors many experi- enee intense facial pressure as the flrst notes emerge from the orchestra pit.

(Anonymous; "When Brains Wring Colors from Words," Science News, 161:189, 2000)

Comment. This is the flrst time we have heard that music can seem to exert physical pressure upon a percipient. We wonder if smell and taste are also affected by music.

Obviously, some neurological circuits are miswired.

PERFECT PITCH

PERFECT PITCH AND SÜNDRY SYNDROMES

Writing in response to a report in Science by G. Schlaug concerning the brain asymmetry observed in musicians with perfect or absolute pitch* (below), O. Sacks expands the domain of the phe- nomenon to inelude other human talents. Sacks says that perfect pitch, though common in musicians, occurs only in about 1 of every 10,000 people. Among the autistic, however, the incidence rises to perhaps 1 in 20. He next moves on to "savants;" that is, individuáis with exceptional mathematic, mechanical, musical, and artistic talents, but with serious deficiencies in other human at- tributes. Calculating prodigies and other "idiot savants" immediately come to mind here. Sachs claims that perfect pitch is is even more common among the savants. In fact, all muscial savants seem to have it. Perfect pitch is also common among those with Williams syndrome, which he defines as:

> —a syndrome which predisposes to hyperacusis and exceptional develop- ment of auditory, musical, and verbal skills, combined with striking visual and conceptual déficits.

(Sacks, Oliver; "Musical Ability," Science, 268:621, 1995)

* A person with perfect pitch can identi- fy a tone without needing a second tone for comparison.

CURIOUS BRAIN ASYMMETRIES

Perfect pitchers vs. everyone else. An individual possessing perfect pitch can identify any musical note without comparing it to a reference note. It is said to be a uniquely human talent. (But how can we know?) Language, too, is thought to be be a gift accorded only to humans. Is there a biological con- nection between these "unique" capabili- ties?

Since language is primarily a left-brain function, it is logical to see if the secret of perfect pitch resides in that half of the brain, too. This is just what a group of researchers headed by G, Schlaug did with the help of magne- tii resonance imaging. They compared the planum temporale regions in the brains of 30 musicians (11 with perfect pitch, 19 without) and 30 non-musieians —all matched for sex and age. The left planum temporale región was larger than the right for both musicians and non- musicians, but in the musicians the asymmetry was twice as great. Further- more, the musicians blessed with perfect pitch were the most asymmetric of all in this respect.

(Schlaug, Gottfried, et al; "In Vivo Evidence of Structural Brain Asymmetry in Musicians," Science,- 267:699, 1995. Nowak, Rachel; "Brain' Center Linked to Perfect Pitch," Science, 267:616, 1995)

Comment. Perfect pitch is nice to havé, but why should it have evolved at all seeing it has little survival valué? What good is perfect pitch------or any kind of musical talent----in tracking animáis or grubbing for tubers?

Women vs. men. In another application of magnetic resonance imaging, B. Shaywitz and colleagues at Yale compared the inferior frontal gyrus areas of the brains of men and women engaged in language tests. Specifically, they were being asked whether or not two nonsense words rhymed. Men, they found, use only the left inferior frontal gyrus area, but in women both left and right areas were activated. Conclusión: women, who regularly score better than men in linguistic tests, may acquire this extra capability by harnessing both halves of their brains.

(Aldhous, Peter; "Why Women Are Better with Words," New Scientist, p. 10, February 18, 1995)

IS PERFECT PITCH FAVORED BY NATURAL SELECTION?

People with perfect pitch can identify, play, and/or sing a particular musical note without flrst hearing a reference note. (See above Ítems.) Even if a string of notes is played randomly, they . can instantaneously ñame them. Although musical training while young fosters perfect pitch, the talent also runs in fami- lies. A study of 500 musicians, with and without perfect pitch, by N. Freimer at the University of California, revealed that half of those claiming perfect pitch knew family members of like talent. Only 5% of those without perfect pitch made this claim. (Ref. 1)

At the North Shore University Hospital, Manhasset, NY, P.K. Gregersen and M. de Andrade were able to lócate 126 perfect-pitchers. In this select group, 5.5% had parents with perfect pitch, and 26% had siblings thus gifted. Among musicians lacking perfect pitch, the figures were 1.1% and 1.3%, respectively. (Ref. 2)

An unexpected (to us, anyway) cor- relation of perfect pitch and synethesia (vol. 1) was made by Freimer's group. Some perfect-pitchers swear they can "see" musical notes, and even "smell" and "taste" them! (Ref. 1)

(Ref. 1. Day, Michael; "Keeping Perfect Pitch in the Family," New Seientist, p. 19, November 23, 1996. Ref. 2. Travis, John; "Pitching in to Find a Musical Gene," Science News, 150:316, 1996) ----------

Comment. Since perfect pitch would seem to be of little use to primitive hu- mans in hunting and gathering, why was it selected for? Likewise, syne- thesia seems to have little adaptive valué; in fact, it might even be detri- mental if humans on the brink of survival were confused by exotic sensations.

CONSCIOUSNESS

THE CONSCIOUSNESS GENES

We humans assume that our conscious- ness is something more than just the sum total of all our senses, as integrated by our brains. In other words, con- sciousness is something "special" that makes us more than automatons. Other animáis may be automatons, but not us!

D. Jones speculates in Nature that if consciousness is a definite, " inheritable characteristic, it must have had survival valué for it to have evolved. It then follows that consciousness must be en- coded somewhere in our genes. Only a single gene may be enough, for consciousness seems to be an uncomplicated phenomenon. Why? Because just a few simple molecules, such as those found in anesthetics, can disable it completely without affecting other bodily functions.

Eventually, Jones continúes, the gene (or small number of genes) respon- sible for consciousness will be identified. Then, we can determine for certain if any of the lower animáis are also con- scious. We think ehimps and dolphins might be, but we're not really sure un- til we see if they have the necessary genes. In fact, the old-time behaviorists could be right, and all the other animáis really are merely automatons. That would definitely make us "special"!

Once we have the consciousness genes in our labs, we can introduce them into those other species, such as Rover and Kitty, upon whom we would like to con- fer the boon of consciousness. Many interesting experiments could be per- formed, ineluding, of course, the elimi- nation of consciousness genes in certain selected human subjects!

(Jones, David; "States of Non-Mind," Nature, 403:263, 2000)

INFORMATION-TRANSFER PROCESSES

AN INVISIBLE INFORMATION SUPERHIGHWAY?

The eclectic nature of anomaly research occasionally uncovers connections between diverse areas of research. We recount one such instance here.

On one hand is the neurological research of M.A. Persinger, at the Lauren- tian University, inquiring into the claimed effects of minute electromagnetic signáis, such as those observed in the geomagnetic field, upon human consciousness and perception. On the other hand, we have R.G. Jahn's work in the Prince- ton Engineering Anomalies Research (PEAR) program, which looks into the anomalous information transfer between humans and the environment, as claimed to be seen in psychokinesis and remóte viewing experimente. The research goals and methodologies differ, and the resul- ting reports couched in different termin- ologies, but the similarities are what is really important. Both scientists are exploring unconventional information pathways eonnecting the human brain (consciousness) and the environment. The pathways are open in both direc- tions.

First, we quote the summary from a recent Persinger paper. The jargon may ■ - be technical, but one can readily visual- ize the human brain immersed in a sea of signáis—nominally electromagnetic but possibly of other sorts.

> Contemporary neuroscienee suggests the existence of fundamental algorithms by which all sensory transduction is translated into an intrinsic, brain-specific code. Direct stimula- ’ tion of these codes within the human temporal or limbic cortices by applied electromagnetic patterns may require energy levels which are within the range of both geomagnetic activity and contemporary communication networks. A process which is coupled to the narrow band of brain temperature could allow all normal human brains to be affected by a subharmonic whose frequency range at about 10 Hz would only vary by 0.1 Hz. (Ref. 1)

Second, Jahn sees a remarkably similar information channel, but of a cryptic nature, eonnecting humans to the environment in PEAR's psychokinesis and remote-viewing experiments. In describ- ing his model of this information channel, Jahn writes:

> Like physical light (energy) and elementary partióles (mass), consciousness (information) enjoys a wave/ partióle duality that aUows it to cir- cumvent and penétrate barriere and to resonate with other consciousnesses and with appropriate aspeets of the environment. Thereby it can both acquire and inserí information, both objective and subjective, from and to its resonant partners. (Ref. 2)

The immense body of empirical data amassed by Jahn's PEAR laboratory certainly suggests the existence of an all-pervading information-transfer médium that is independent of space and time.

Persinger relies upon a different corpus of research: neurological experiments as well as scores of his own stu- dies of the effects of the geomagnetic environment upon human perception and consciousness.

Both Jahn and Persinger write of information flow. The ideas of brain matrices and resonances are not too dissimilar. Persinger relies upon the electromagnetic médium; Jahn's is not specified.

Jahn and Persinger are visionary regarding their research. It is perhaps well to reproduce Persinger's warning:

> Within the last two decades, a potential has emerged which was improbable but which is now marginally feasible. This potential is the technical capability to influence directly the major portion of the approximately six bil- hon brains of the human species without mediation through classical sensory modalities by generating neural information within a physical médium within which all member of the species are immersed. (Ref. 1)

Can Orwell's Big Brother be far away? Some writers, such as J. Vallee, suggest that we are already being manip- ulated via some. unrecognized information channel.

Surely all readers of SF will under- stand that Science and Nature do not yet publish the types of research just described.

(Ref. 1. Persinger, M.A.; "On the Possi- bility of Directly Accessing Every Human Brain by Electromagnetic Induction of Fundamental Algorithms," Perceptual and Motor Skills, 80:791, 1995. Ref. 2. Jahn, Robert G.; "'Out of This Aboriginal Sensible Muchness': Consciousness, Information, and Human Health," American Society for Psychical Research, Journal, 89:301, 1995)

MISCELLANY

WHY MUSIC?

Except for a few tone-deaf people, such as General Grant, humans love music. It's not only in their blood but in their brains. Humans like to listen to music, sing it, and dance to it. As soon as they figured out how to make bone ñutes and skin drums, they played it .

Music is wired into the human brain. All of our sensory organs are associated with music; and for each organ there is a special part of the brain for Processing the music it detecta. Also, a working memory is reserved for storing pieces of music while the brain-as-a-whole tries to comprehend the entire tune. This storage area seems to be somewhere in the temporal lobes. Long-term memory for tunes, which is exceptionally good—it is difñ- cult to forget a song—is located else-

where in the brain, but no one is sure just where. The point here is that the human brain apparently has neural cir- cuits and memory caches dedicated to musie.

Interestingly, these dedicated neurons and memory caches need not be activated by input sound. A person needs only to imagine a tune and these speelalized portions of the brain "light up," as re- vealed by positron-emission tomography (PET).

But what evolutionary valué is there in all this specialized neural equipment? There is no obvious survival valué in being able to sing an aria from Carmen or in composing a march or waltz. Mozart was an exceptional composer but died young. General Grant was amusical and was annoyed whenever a band marched by, yet his evolutionary fitness was not eompromised. Those persone bereft of musie genetieally survive quite well. So, what impelled the development of the human passion for it?

(Munte, Thomas F.; "Brains Out of Tune," N ature, 415:589, 2002. Abbott, Alison; "Musie, Maestro, Please!" Nature, 416:12, 2002)

Comment. The same questions can be asked about mathematical talents and many other human attributes not shared with other animáis.

MENTAL GYMNASTICS

In strength-training there is a well- known "crossover" effect. If you exer- c-ise just one limb, there will also be a measurable change in the corresponding unexercised limb.

(Ball, Derek; "Just Think It," New Scientist, p. 56, December 15, 2001)

But strength-training can be made even easier, as demonstrated by researchers at the Cleveland Clinic Foundation in Ohio.

> They asked 10 volunteers aged 20 to 35 to imagine flexing one of their bíceps as hard as possible in training sessions five times a week. The researchers recorded the electrical brain activity during the sessions.
> To insure the volunteers weren't unintentionally tensing, they also monitored electrical impulses at the motor neurons of their arm muscles.

The strength of the volunteers' muscles increased 13.5% after a few weeks. Controls who did not think about exer- cising their bíceps showed no improve- ment.

(Chien, Philip; "Mental Gymnastics," New Scientist, p. 17, November 24, 2001)

THE VEGETABLE CONNECTION

Within the human brain, probably quite cióse to the number module, there must be a "vegetable module"; that is, a few brain cells that recognize and process information about vegetables. Further- more, there must be cross-talk between the vegetable and number modules.
This is obvious from the following query posted in New Scientist.

> Why is it that when you repeatedly ask someone addition problems that all add up to six (such as two plus four, one plus five) for a number of minutes and then ask them to think of a vegetable, 90 per cent of people will say "carrot"?
> The person you are asking must have no knowledge of what you are asking them or why. The questions should be asked rapidly, encouraging the person answering to answer them quickly with little thought.

(Versteegen, Adam; "Carrot Brains," New Scientist, p. 97, Jule 24, 1999)

ENGLISH MUDDLES THE BRAIN

> A boy who struggles to read English primary-school storybooks yet has no trouble with university physics text- books in Japanese is challenging cur- rent thinking on dyslexia. The 17- year-old boy, known as AS, is the first person shown to be dyslexie in one language but not another.

AS has English-speaking parents but lives in Japan, where he attends Japanese primary school. He scores poorly in reading English, even lagging behind his Japanese schoolmates, but he under- stands English like a native. AS is also taught to read the Japanese form of writing called "kanji", in which the sym- bols carry meaning but have no phonetic valué—unlike written English. Curiously, AS reads kanji easily, exhibiting no problems in his visual Processing skills. He also does well with the other type of Japanese writing called "kana", where symbols do correspond to certain sounds. Written English is the problem!

AS presente psychologists with two enigmas:

(1) If, as currently believed, a spe- cific part of the brain is reserved for reading, and a person has trouble with one language, it seems logical that he should have difficulties with all lan- guages.

(2) The conventional theory of dys- lexia asserts that it is associated with visual Processing. If so, AS should find kanji even more troublesome than English.

(Motluk, Alison; "Why English Is So Hard on the Brain," New Scientist, p. 14, January 20, 1996)

DOES IT PAY TO LIE?

> Man is the only animal that lies to members of its own species. All other animáis when communicating with their own kind pass on factual information; misinformation in the case of lower animáis is reserved for 'communication' with members of other species.

Man and the other animáis practice deception frequently when interacting with other species: the mimicry of the walking stick, the angler fish's lure, the human- made duck blind, etc.

This intriguing artiele explores the rewards humans receive in deceiving other humans, as measured by increased evolutionary 'fitness.' The author's con- clusión is that slightly misleading in- formation has only about a 50:50 chance in increasing fitness. He remarks:

> To really be effective, a lie must be grossly misinformative.

(Wallace, Bruce; "Misinformation, Fitness, and Selection," American Natura- list, 107:1, 1973)

Comment. Actually, sorae animáis do mis- lead members of their own species. For example, sentinels will sornetimes "cry wolf" and give false signáis to obtain more food for themselves. Some male salmón (called "she-males") emulate females in appearance and behavior in order to surreptitiously fertilize eggs being deposited by normal mating pairs.

PSYCHOKINESIS

OVERVIEW

Psychokínesis (PK) oc.curs when physicai objects————————popularly spoons or **compass needles---are apparently bent, deflected, or otherwise affected** by the mental activity of one or more individuáis. Many claims for the reality of PK origínate under relatively uncontrolled circumstarices, such as stage performances and the so-called PK parties. In Science Frontiers, these data are very scarce because they hardly ever make the pages of the scientific journals that we rely upon almost exclusively.

There also exist claims that major natural and human-instigated events, such as great earthquakés and the 9/11 terrorist disaster in New York City, generate worldwide psychokinetic phenomena. With these, too, it is difficult to convince mainstream scieritists of the reality of these phenomena. The reason: they challenge long-standing paradigms concerning the make-up of the universe.,-

Even with the most careful application of approved scientific Controls, experiments favoring the existence of psychokínesis are generally rejected by science-at-large. The reason for this prejudice ís not hard to find. The reality of PK would undermine the very foundations of all scientific observations, because it would then be possible that the human mind could affect all observations of nature, from the swinging of a pendulum to the switching of transistors on laboratory instruments.

MENTAREY INFLUENCING THE STRUCTURE OF WATER

If the presenee of water can physiologi- cally affect a human dowser, as claimed in the preceding ítem, perhaps the physiologieal state of a human can affect the properties of water. Well, it's worth a try!

G. Rein and R. McCraty, of the In- stitute of HeartMath, first define two physiologieal States:

> **We have recently defined two new physiologieal States in terms of their unique electrophysiological eharaeter- istics. These states are generated using speeially designed mental and self- management teehniques which in- volve intentionally quieting the mind, shifting one's awareness to the heart area and focussing on positive emo- tions. Time-domain and frequeney speetral analysis of heart rate vari- ability, pulse transit time and respira- tion were used as electrophysiological measures of these states.**

Next, the two researchers brought together subjeets immersed in one of these states and samples of water:

> **The present study reports on PK [psychokinetic] effeets associated with these intentionality states. ECG monitoring was used to demónstrate when the individuáis were in the en- trained state. At this point a sample of distilled water in a sealed test tube was presented to the subjeets. Five individuáis were used in this study.. .While holding a beaker con- taining the samples, subjeets were asked to focus on the samples and intentionally alter the molecular struc- ture for five minutes. In an adjacent room, control samples were aliquoted from the original stock solution into test tubes.**
>
> **The results indícate that treated water shows higher absorbance valúes at 200 nm compared with Controls which have higher valúes at 204 nm. These results extend previous find- ings which observed characteristic changes in IR spectra of water ex- posed to bioenergy from healers.**

(Rein, Glen, and McCraty, Rollin; "Structural Changes in Water and DNA ' Associated with New Physiologically Measurable States," Journal of Scientific Exploration, 8:438, 1994.)

Comment. To anyone whose reading is confined the the mainstream scientific press, the foregoing Ítems must seem incredible. Are there really researchers pursuing phenomena proscribed so vigor- ously by the scientific establishment?
Yes! And there are many of them; but they get published only in small-circula- tion "fringe" journals. ■

FOCDSED GROUP ENERGY (FGE)

Anyone who has played a team sport can appreciate FGE. The team resonates and seemingly can do no wrong. The following quotation conveys this sense of "group attunement."

> **Every so often we hear of a group of people who unite under extreme pres- sure to achieve seemingly miraculous results. In these moments human be- ings transcend their personal limita- tions and realize a collective synergy with results that far surpass expecta- tions based on past performance. Any- one hearing a fine symphonic or jazz group hopes for one of those "special" concerts that uplift both the audience and the performers. Perhaps less fre- quent, but more spectacular, are ex- amples in sports, such as the 1980 U.S. Olympic Hockey Team, a group of talented amateurs who stunned the world by winning the gold medal against the vastly more talented and experienced, • virtually professional Russian and Finnish teams. These oe- currences, although unusual, are much more frequent in American business than is commonly suspected. ***

Assuming that FGE is a real pheno- menon, can it be measured objectively? Yes, says W.D. Rowe, and he tells how it has been done. The Princeton Engineer- ing Anomalies Research group has devel- oped a random number generator that produces an unbiased series of bits such that a large sample will average 50% ls and 50% Os. PEAR normally uses this machine in psychokínesis experiments in which an individual mentally attempts to skew the statistically expected 50:50 out- come. But that's a different story. Here, the thought is that the PEAR random number generator is also a "consciousness detector." Since FGE seems to involve a group's collective consciousness, perhaps this random number generator will re- spond with a skewed train of ls and Os —even when the group in unaware of it presenee.

Rowe reports that eleven group ex- periments have been carried out in which FGE seemed to be present according to participante. During these periods of group resonance, often hours long, the random number generator produced results that were two, so'metime three standard deviations from the mean. Rowe con- cluded that FGE is a real and robust phenomenon that can be measured. It is "an extra sense above the five common senses."

(Rowe, William D.; "Physicai Measurement of Episodes of Focused Group Energy," Journal of Scientific Exploration, 12:569, 1998)

♦Keifer, Charles F., and Senge, Peter M. "Metonic Organizations: Experiments in Organizational Innovation," in Visionary Leadership, Framingham, 1982. As quoted in the above reference.

Comments. If it is real, the impUcations of FGE are enormous. Any physicai measurement or Computer calculation can

be skewed by FGE, perhaps not intentionally! Understandably, mainstream scientists cannot aecept FGE or psychokinesis, for they undermine the objective measurements that Science depends upon.

We venture that FGE might also transpires at the level of the individual. We all have days when all goes well and the entire world seems in tune. Further, FGE could easily inelude animáis, as with a horse and its rider in a "resonating" rodeo performance.

AND THE MACHINES WEPT FOK MAN

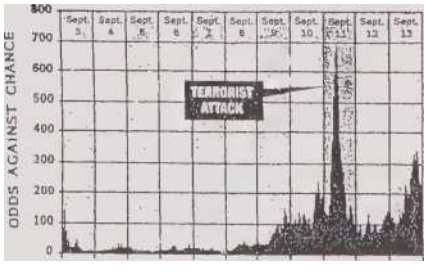
Philosophers have always wondered if humans and life in general are really completely detached from the material world of non-life. Might there be un- recognized influences humans (and possibly other animáis) exert knowingly or unknowingly upon inert matter? Many have been the experiments in which humans attempt to affect the swinging of a pendulum, the throws of dice, or the output of a random-number generatoj. The parapsychologists declare that,
YES, humans can exert tiny but statisti- eally significant influences on such devices.

But other scientists and the man-in- the-street would really like to see a robust physical effect, not just a bunch of statistics. An ambitious endeavor cal- led the Global Consciousness Project just might be able to produce a more satisfy- ing mind-over-matter effect.

This Project is condueted by a group of scientists who maintain a dispersed network of random-number generators (RNGs). A total of 38 RNG stations are presently "listening" for global perturba- tions in whatever médium carries the supposed human-to-matter influences.
The analogy to global weather and seismological stations is appropriate here.

On September 9, 2001, the Global Consciousness Project network of RNGs did indeed detect a sort of groaning in the consciousness of the planet's human cargo. The dispersed RNGs produced strings of numbers that were rather far from random, as indicated on the accom- panying graph. For three days the RNGs defied probability, with stark non- randomness obvious at 10:12 AM Eastern Daylight Time on September 11. One can hypothesize that collective humanity recoiled at the TV images of tlie World Trade Center catastrophe.

But there are skeptical interpretations. For example, the sharp rise in global Communications and radar aetivity might have somehow perturbed the RNGs.



Improbable outputs of a distributed network of RNGs around September 11, 2001

(Bishop, Bill; "Is It Global Consciousness or Mere Coincidence?" Austin American Statesman, October 23, 2001. Cr. D. Phelps.)

Comment ■ Recognizing Nature's frequent symmetry, might not material entities (e.g., RNGs) influence humans in some subtle ways?

REDEFINING SCIENCE

The rules of today's Science are rigor- ously objective, with no place for sub- jective or consciousness-related factors. These are eliminated by requiring that all experimental results be reproducible by all normal people. Otherwise, every UFÓ~sighting by any individual and each claim of telepathy would be legitímate scientific evidence. Such stringent re- quirements have made it difficult for parapsychologists to get their experimental results, no matter how earefully acquired, to be taken seriously by mainstream Science.

How, then, can parapsychology be "legitimized" in the *ejes* of all scientists? Easy! By redefining Science. This is what R.G. Jahn and B.J. Dunne have proposed in a long, philosophieal article in the Journal of Scientific Exploration. They define a "neo-subjective" science, which retains the "logical rigor, empiri- cal/theoretical dialogue, and cultural purpose" of present-day "rigorously ob- jective" science, but would:

(1) Allow a proactive role for consciousness;

(2) Be more explicit and profound in the use of interdisciplinary metaphors;

(3) Permit more generous interpretations of measurability, replicability, and resonance;

(4) Reduce onotological aspirations; and

(5) Permit an "overarching teleologi- eal causality.

R.J. Jahn heads the Princeton Engineering Anomalies Research (PEAR) Laboratory, which over the years has condueted some 50 million experimental triáis, mostly in the search for psycho- kinetic effeets on the behavior of a wide variety of mechanieal, electrical, and other types of machines. Jahn and Dunne assert that the results of those experiments clearly show the effeets of the pre-stated intentions of the machine operators. In other words, mind can affect matter—as in the distribution of spheres cascading down a peg board.

We now list some of the other salient features of the ímmense corpus of PEAR experimental results:

(1) The scale and character of the results are rather insensitive to the type of random devices (machines) em- ployed;

(2) Operator learning and experience have no effect on performance;

_ (3) Operators may exert their "intentions" on the machine hours or days be- . fore the machine is run and still produce results similar to "on-time" machine operation; and

(4) The distance between operator and machine has no effect on the results.

(Jahn, Robert G., and Dunne, Brenda J. "Science of the Subjective," Journal of Scientific Exploration, 11:201, 1997)

Comment. That PEAR results are unaffected by by the timing and distance of the operator attempting to affect the behavior of the machine is somewhat troublesome to many scientists, but not inconsistent with some predictions of quantum mechanics. Much more serious to objective science is the implication that a scientist performing an experiment can subjectively (consciously or uncon- sciously)" affect his results, as in the psychokinetic control of a meter reading or an electronic data processor. If such things can happen, one. scientist could not replícate the experiment of another scientist.

Chapter 7

CHEMISTRY, PHYSICS, MATH, ESOTERICA

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CHEMISTRY

MECHANICAL CHEMISTRY

In conventional atom-smashing, subatomie partióles blast target atoms into pieees. However, if we increase the bombarding partióles to the size, say, of ball bearings, the smashing promotes syn- thesis.

Organic Chemicals often possess a stable crystalline structure that must be crushed before the constituent atoms are "loose" enough to combine with other atoms. Organic chemists generally employ solvents to free atoms from these crystalline constrictions. Unfortunately, these solvents are frequently toxic and hard to dispose of safely.

Since ball-milling has been used successfully to modify metal alloys, V. B alema and coworkers at the Ames Laboratory in Iowa wondered whether the crushing forces in a ball-mill might sub- titute for the solvents in loosening up - Chemical structures.

They tried ball-milling the Chemicals used in several well-known industrial procésses. Surpringly to all, the desired reactions proceeded efficiently without solvents, even producing higher yields in some instances.

The new buzz word is: "mechano- chemistry."

(Minkel, J.R.; "Great Balls of Steel," New Scientist, p. 19', June 15, 2002.)

Comment. Now we are free to surmise about the possible role of meehano- chemistry in the origin of life on the early earth and elsewhere in the cosmos. After all, on earth there were long periods of intense asteroid and meteor bombardment that could have accelerated proto-life reactions. Proto-life molecules common in meteors could be forced by impacts into more complex molecules. Could life have been a blast from the beginning?

TOEN GOLD GOES BAD

Gold is universally recognized for its immutability, its "nobility," its durabil- its, and its unreactivity. The main rea- son for these admirable charaeteristics is that gold loves itself! It's "aurophilic." The gold atoms are normally tightly bound to each other—but they can be seduced!

Shrink the size of gold particles to nanometer size (say, less that 100 atoms), spread them on a substrate such as titanium oxide, and they become power- ful catalysts. Even scientists describe the behavior of nanopartieles of gold as "wanton" and "licentious" when they meet some metal oxides! Why this sudden immorality of gold? Several theories are on the table, but no one kno.ws for sure.

(Cho, Adrián; "Connecting the Dots to Custom Catalysts," Science, 299:1684. 2003.)

Even when not tempted by metal ox- ides, gold nanopartieles go on wild binges. Clusters up to 40 atoms will ar- range themselves in left- and right- handed spirals like the stripes on a barber's pole.

(Anonymous;."Aurophilicity," New Scientist, p. 49, February 8, 2003.)

But not all gold nanopartieles can be seduced. In AU2Q, for example, the atoms may arrange themselves in a tetra- hedral cluster that retains most of the stability and inertness of bulk gold.

(Li, Jun, et al; "Au_2o: A Tetrahedral Cluster," Science, 299:864, 2003.)

WHEN LIKE CHARGES ATTRACT

The above title implies that a basic law of physics has been overturned. Indeed, a commentary in Nature by C.A. Murray begins as follows:

> Larsen and Grier, on page 230 of this issue [Ref. 2], show that two similarly charged polymer spheres suspended in water can attract each other when they are several diameters apart. This surprising result casts some light on a tricky theoretical many-body problem that has been swept under the rug for a century, and it has implications for colloids in nature and in industrial processes. (Ref. 1)

Exactly what happens is not yet clear. This counter-intuitive phenomenon occurs in a many-body situation, where sereening charges are established be- tween the like-charged spheres. Al- though Coulomb's Law states that like charges repel one another, the presence of sereening particles complicates the picture, as do the van der Waals dipole interactions.

The microscopic situation may be murky, but there is no doubt on the macroscopic level that unexpected at- tractive forces are operating. For ex- ample, when sub-microscopic, electri- cally charged látex spheres are sus- pended in water, one would expect a homogeneous colloidal soup. Instead, the tiny, charged spheres pulí themselves together in patchy, but ordered arrays. These metastable groupings of spheres are called "crystallites." Theo- rists are not certain what is going on.

(Ref. 1. Murray, Cherry A.; "When Like Charges Attract," Nature, 385:203, 1997. Ref. 2. Larsen, Amy E., and Grier, David G.; "Like-Charge Attrac- tions in Metastable Colloidal Crystallites," Nature, 385:230. 1997)

THE DARWINIAN BREEDING OF NANOSTRDCTÜRES

We normally think of DNA in terms of biological structures-----as the essence of living entities. DNA, however, is really only a long string of nucleotides; that is, only a lifeless Chemical. But lifeless Chemicals often spontaneously crystallize or combine to form rather complex geome- tries. In this vein, it is not. surprising to read the following (rather technical) declaration by W.M. Shih et al in Nature.

> Here we report the design and syn- thesis of a 1,669-nucleotide, single- stranded DNA molecule that is readily amplified by polymerases and that, in the presence of five 40-mer synthetic oligodeoxynucleotides, folds into an octahedron structure by a simple denaturation-renaturation procedure.

The implications of this long and formidable sentence are far-reaching.

- The folding of 1,669 nucleotides into an octahedrom is spontaneous and rapid ----------just as when proteins fold.
- Structures created spontaneously from DNA can be cloned with the help of bacteria.
- "You can start breeding for structure," says G. Joyee, a molecular biologist at Scripps Research Insti- tute.

The breeding of DNA structures en- tails the exposure of DNA to different environments, a process in which the best structures can be selected! For example, in the case of a large sample of different DNA octahedrons, the strongest can be picked out.

(Shih, William M., et al; "A 1.7-Kilobase Single-Stranded DNA That Folds into a Nanoscale Octahedron," Nature, 427: 618, 2004. Goho, A.; "Snappy RNA," Science News, 165:99, 2004)

Comment. It is but a short leap to imagine N ature's laboratory applying different environmental forces to ehains of DNA.

Are we stretching too much if we go farther along this path?

MIXED ANOMALIES

Scientists have developed laws that describe accurately the flow of liquíds ' 7at least in most cases. (See Comment below in this regard.)

However weird some of the antics of flowing liquids may be, they are eclipsed by the phenomena of flowing granular materíais. Most of these granular pheno- mena are not well-understood, yet they often are the sources of amusement and also great concern in agricultural and industrial processes.

The salt-and-sand high-school demonstration. If a vertical, clear plástic: tube is loaded with part salt and part black sand and set to rotating, contrary to expectations, a uniform gray mixture does not form. Rather, crisp black bands of sand are created. As tube ro- tation continúes, some bands disappear and new ones are created. (Ref. 1)

Axial mixing of grains of different size. If a rotating drum's innards are imaged by MRI (Magnetic Resonance Imaging), the fine partióles are seen to form a roughly circular shaft along the drum's axis. This shaft develops bulges that grow and shrink. Some bulges reach the sur face in the form of bands of small particles surrounded by the larger partióles. (Ref. 1)

Double-cone blender surprises. If grains of two sizes are loaded until the blender is more than a quarter full, the particles are quickly and totally separated upon rotation, with the smaller particles crowding the sides. But, if the volume of grains loaded is just 1% less or the blender's rotation is increased, the pat- tern of segregation flips with the larger grains moving to the outside. (Ref. 1)

Arches burst silos. The grains filling a silo have slightly different shapes and roughnesses, which makes some more ''sticky" than others. Where good contact between grains exists, "necklaces" or "arches" of fused, consecutive grains form suddenly. These strüetures snake through the pile of grain creating block- ages. The arches can even transfer the weight of the pile of grain from the silo's bottom to its sides. Burst silos sometimes result. (Ref. 2)

References

Ref. 1. Weiss, Peter; "Mastering the Mixer," Science News, 164:54, 2003. Ref. 2. Biever, Celeste; "Go with the Flow," New Scientist, p. 38, August 2, 2003.

Comment. See p. 308 for "Fluid corners in kitchen sinks," and "Spinning-egg water-sprinkler."

PHYSICS

PARTICLE PHYSICS

INSIDE SOME "FUNDAMENTAL" PARTIOLES

Neutrons were named for their lack oí electrical charge. The ñame is apt as long as you don't get too olose. You see:

> **New data from the Thomas Jefferson National Accelerator Facility in Newport News, Va., reveal a slight positive charge at the neutron's center and a slight negative charge at its suriace.**

Apparently a neutron's innards are considerably more complex than the textbooks suggest.

Another "fundamental" partióle, the proton, also possesses a perplexing interior. For there, the distribution of electrical charge differs from that of the internal magnetic field.

(Weiss, P.; "Not-So-Neutral Neutrón," Science News, 161:262, 2002)

Comment. It is well known that the neutrón, once freed from a nucleus, is radioactive. It decays with an 11-minute half life into a proton, an electrón, and an antineutrino. If the proton is radio- active, science has not been around long enough to register any decays.

SPLITTING THE ELECTRON'S CHARGE

We all know that the atom can be split, but the electron's charge? No way! R.A. Millikan's oil-drop experiments, circa 1911, demonstrated conclusively that the basic, indivisible unit of electrical charge was that on the electrón. Later, an exeeption was made for those quarks that are firmly locked up inside nuclear partióles. They eaeh have 1/3 the electron's charge—but they never, never escape to the outside world.

It was, therefore, counterintuitive when R. Laughlin proposed in 1982 that fractional electrical charges actually could show up elsewhere in physics. The phenomenon that suggests this possibi- lity is the Fractional Quantum Hall (FQH) effect. Physicists reluctantly accepted the likelihood of fractional charges in this well-verified phenomenon; but the experiments demonstrating fractional charge were a bit esoteric----------the frac tional charges were not "palpable" enough.

Two new experiments have made fractional charges much more tangible. When a layer of electrons, held just above absolute zero, is subjected to a powerful magnetic field, you can almost "hear" the fractional charges. The signáis from these experiments have been likened to hail hitting a tin roof. Just as you can gauge the size of hailstones from_ their impact, so you can estímate the electrical charges involved in these experiments---they are 1/3 that of the electrón.

(Ehrenstein, David; "Slicing an Electron's Charge into Three," Science, 277:1766, 1997. Also: Kane, Charles L., and Fisher, Matthew P.A.; "A Shot in the Arm for Fractional Charge," Nature, 389:119, 1997)

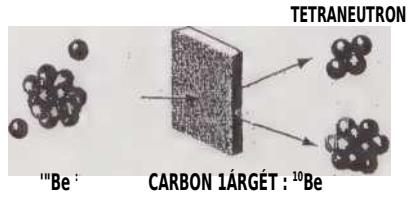
Comment.' Is there nothing in the subatomic world that is indivisible?

ELEMENT 0

Element 0 is not on the standard Periodic Table, which, as everyone knows, be- gins with element 1, H for hydrogen. The hydrogen nucleus always contains one proton, but it may be accompanied by 1, 2, orj neutrons. These neutrons give us normal hydrogen, deuterium, and tritium, respectively. It is that single proton that gives hydrogen first place on the Periodic Table. What could possibly precede hydrogen in the revered Table?

In a recent experiment at the CNRS Laboratory for Nuclear Physics at Caen, F.-M. Marques and colleagues uninten- tionally created tetraneutrons, clusters of four neutrons bound together by some unrecognized forcé. A tetraneutron can be thought of as ¡Jx, or element 0, for there is no proton in the cluster. If element 0 is confirmed by other scien- tists, we will need to determine what sort of forcé binds the four electrically neutral partióles together.

Actually, Marques and bis group were studying another nuclear oddity: "halo nuclei." Usually, an element's neutrons are confined tightly in the nucleus, but in halo nuclei a few orbit the nucleus like distant planeta. For example, two of the ten neutrons of gBe seem to be orbiting the beryllium nucleus while the other eight are nestl- led together with the four protons.



When beryllium-14 (with its two halo neutrons) smashes into a carbón target, a tetraneutron is sometimes created. Said tetraneutron may be either in the parallelogram configuration shown or a pyramid.

(Samuel, Eugenie; "Ghost in the Atom," New Scientist, p. 30, October 26, 2002.)

Comment. Another surprising suggestion for anomalous nuclei sees carbon-12 as an orbiting trio of alpha particles: T8c = 3 |He.

BTT AND SURREALITY

If you think that Beloff's "rent" in the fabric of the cosmos is a bizarre concept, it's because you haven't heard about BTT. Named after S. Banach and A. Tarski, the Banach-Tarski Theorems (BTT) were conceived 70 years ago, and they have challenged common sense ever since. Of course, no one expects that all branches of mathematics will mirror physical reality; but BTT is defi- nitely ultra-weird, so much so that we had to invent that adjective! Take, for example, this specific BTT result pre- sented by B. Augenstein:

> **"In particular, a solid sphere with unit radius can be cut into five pieces in such a way that two of the pieces can be reassembled into one solid sphere with unit radius, while the other three pieces are reassembled into a second solid sphere with unit radius. These are the minimum numbers of pieces required to do the trick, but it can be repeated indefi- nitely."**

Impossible, you say? Can one sphere fragment and be reconstituted as two solid spheres of the same size? Regard- less of what the math says, it cannot happen in the real world! Well, BTT actually does mirror just such a phenomenon found in partióle physics:

> **"The magical way in which a proton entering a metal targét can produce a swarm of new copies of protons emerging from that target, each iden- tical to the original, is precisely de- scribed by the BTT procesa of cut- ting spheres into pieces and reassem- bling them to make pairs of spheres."**

(Gribbin, John; "The Prescient Power of Mathematics," New Scientist, p. 14, January 22, 1994. Cr. P. Gunkel.)

Comment. Would it be frivilous to ask that if protons can multíply thus (seem- ingly magically), why can't fish fall from the sky? Many anomalous phenomena might be explained by BTT and other surreal math, but scientists seem to apply such thinking only to particle physics and cosmology.

STRUCTURE OF MATTER

MIRROR MATTER MAY MATTER

**Mirror Matter, if it exista, would be difficult to detect because it does not emit radiation to betray its presence. It interacts with Normal Matter (us and our instrumente) only through its gravitation- al pulí. The Mirror-Matter concept has been around since the 1950s because physicists needed (and still need) "some-
thing" that balances the universe-------
which if you haven't noticed is asym-
metrical. To illustrate this cosmic ”de-
formity," note that Normal-Matter neu- trinos always spin in the same direction, when half should spin one way and half the other way if the universe is sym- metrical. However, the existence of Mirror-Matter neutrinos spinning the other way would redress things, making the universe "perfect"------at least as far as human aesthetics are concerned.
(Other entities might yearn for asym- metry, who knows?)**

Anyway, Mirror Matter is defined as being palpable and could also be that "missing mass" or "dark matter" that astronomers need to explain why spinning galaxies do not fly apart. Mirror Matter could also account for some mysterious terrestrial phenomena such as that un- aecountable lack of a significant cráter in Siberia, where the 1908 Tunguska blast leveled a huge forest but hardly disturbed the ground.

Recently, Mirror Matter has been invoked to explain the ups and downs of terrestrial biodiversity. R. Foot and Z. Silagadze propose that the 26-million-year periodicity in terrestrial extinetions — claimed to be present in the fossil record—is due to a solar-system planet made of Mirror Matter (and therefore invisible). This postulated planet has a period of 26-million years and regularly gravitationally jostles the Oort Cloud of comets on the periphery of the solar system. These jolts unleash torrente of devastating comets upon the inner solar system every 26-million years, thereby blasting the earth and its sensitive bio- logieal cargo.

This supposed Mirror-Matter planet happens to be the conceptual double of a Normal-Matter, hypothetical planet named Nemesis, which was proposed in the 1980s to account for the same peri- odieal extinetions in the fossil record. However, diligent searches did not lócate Nemesis. Of course, if Nemesis were made of Mirror Matter, as now proposed, it would have escaped telescopio detection then and would still elude our telescopes today!

(Schilling, Govert; "Through the Looking Glass," New Scientist, p. 16, April 28, 2001)

Comment. Not only is a cráter missing at the Tunguska site, but no one has been able to positively identify the immense impact cráter that we suppose must have been excavated when untold numbers of tektites rained down upon Australia, Southeast Asia, and the Indian Ocean about 800,000 years ago. See discussion on pp. 180, 295.

COLD FUSION

COLD FUSION UPDATE: 1994

Coid fusión, though duly interred by mainstream Science, still flourishes at the periphery of Science. The recent Third International Conference on Coid Fusión, held in Nagoya, Japan, drew 350 participants, including 50 from U.S. corporations and government labora- tories. Hardly a wake! But also hardly a confirmation. Even with new results frequently reported, the incontrovertible, reproducible proof of coid fusión de- manded by the scientific community still is lacking.

A written confrontation between coid fusión protangonists and antagonista ap- peared in the March 1994 issue of Physics Today. The "pro" position was stated by E. Mallove, editor of the new journal: Coid Fusión:*

> **The coid fusión phenomenon, in the view of many active in the field, is a spectacular new form of lattice- induced nuclear energy whose meeha- nism is still poorly understood—as the mechanism of low-temperature superconductivity was for decades. That the nuclear producís that have been found so far are incommensurate (by conventional theory) with the non-chemical-magnitude excess ener- gies simply means that the results have to be explained by new physical rnechanisms.**

Of opposite polarity were remarks by J.R, Huizenga, author of the debunking book: Coid Fusión: The Scientific Fiasco of the Century

> **In contrast to Mallove's declaration that coid fusión is a "spectacular new form of lattice-induced nuclear energy," I conclude that there is no per- suasive evidence to support this far- out claim. Instead, coid fusión as a nuclear procese producing watts of excess heat is more likely than not to be an example of pathological Science.**

Of historical interest in this eoUec- tion of correspondence in Physics Today was S. Bashkin's mention of the 1926 experimente of F. Paneth. His results were essentially identical to those of S. Pons and M. Fleischmann that began the present coid fusión furor. Paneth detected helium after passing an electri- cal current through hydrogen-ladeñ palladium! But he later retracted his conclusions.

(Mallove, Eugene, et al; "Coid Fusión: Still a Hot Research Topic," Physics Today, 47:93, March 1994.)

*** Coid Fusión has changed its ñame to Infinite Energy.**

COLD-FUSION PRO-FUSION

It has been three years since we last reported on eold fusión, (above) Coid fusión is an anomaly if there even was one, because mainstream Science vigor- ously exeludes the phenomenon from its journals, such as Science. It is even characterized as "pseudoscience."

Nevertheless, in a 1996 issue of the Journal of Scientific Exploration, E. Storms required 59 pages to review properly recent work on coid fusión. Based on more than 190 studies (his bibliography runs for 12 pages), Storms reveáis just how seriously some "rogue" scientists view coid fusión as a real phenomenon and future energy source. Reflecting the antagonism of the "hot- fusion" community, the U.S. expendi- tures on coid fusión probably do not exceed $1 million/year; Japan, in con-trast, spends about $100 million/year. Coid fusión was not interred elsewhere around the planet and is quite healthy. In Storms' own words:

> **Evidence for large and reproducible energy generation as well as various nuclear reactions, in addition to fusión, from a variety of environ- ments and methods is accumulating.
> The field can no longer be dismissed by invoking obvious error or pro- saic explanations.**

(Storms, Edmund; "Review of the 'Coid Fusión' Effect," Journal of Scientific Exploration, 10:185, 1996)

More recently, the Wall Street Journal commented derogatorily about coid fusión. (February 28, 1997) E.F. Mallove, editor of Infinite Energy, reproached the news- paper by pointing out that hundreds of scientists were working on the phenomenon. He asked:

> **What are you going to tell your fossil-fuel industry readers when they learn that their obituary has already been written by carefully documented, meticulous experiments that show there is something, indeed, very new under the sun?**

(Mallove, Eugene F.; "Fusión Confusión Runs Hot and Coid," Wall Street Journal, March 31, 1997. Cr. E. Fegert.)

**Even more recently, A.C. Clarke, no slouch when it somes to accurate pro- phecy, declined to talk about space travel in an interview with Discover.
He wanted instead to talk about the "new energy revolution." "What energy revolution?" was the query. "Coid fusión," was the response. He added:**

> **Very few Americans seem to know what is happening, which is incredi- ble. It's all over the world, except**

in the United States. There are hundreds of laboratories doing it, they've got patents all over the place. The prototypes are on sale now. There are 7,000 units operating in Russia right now and no one in the United States seems to know about it.

(Clarke, Arthur C.; "An Odyssey of Sorts," Discover, 18:68, May 1997)

Comment. Perhaps there is some overstatement above, but the suppression of the subject in the U. S. Science media cannot be denied.

COLD FUSION NOT SO HOT!

The Japanese government's funding for that country's 5-year, $25-million coid fusión program will cease in March 1998. The work had been pursued at the New Hydrogen Energy laboratory, near Sapporo. IMRA, a foundation sponsored by Toyota, has also contributed financial support. Reason for the loss of government support: The program "failed to find heat generated by coid fusión."

(Anonymous; "Japan Ends Funding for 'Coid' Fusión Project," Nature, 389:10, 1997) ■

Comment. No longer will funds-starved American cold-fusion enthusiasts be able to say, "Look at what Japan is doing." We need more money to compete."

ONE "PATHOLOGICAL SCIENCE" MAY NOT BE SO SICK AFTER ALL!

For over a decade, coid fusión has been filed under "pathological Science" or "pseudoscience." Now, though, the U.S. Department of Energy has promised to rethink the classification of coid fusión.

While mainstream Science and its Media have sneered, a few researchers (probably with tenure or prívate funds) have been experimenting and theorizing. In fact, a theoretical framework for coid fusión has been constructed that makes quantifiable predictions. Cold-fusion proponents now say the phenomenon has been firmly verifled.

G. Miley, professor of nuclear engineering at the University of Illinois, says:

> There's so much new, valid scientific evidenee that it's high time to take another look. I'm hopeful that a fair review will remove any remaining prejudice, so research proposals in coid fusión will finally be able to compete on their merits.

(Anonymous; "No Coid Shoulder," New Scientist, p. 6, March 20, 2004)

Comment. A wing of the Science Hospital is full of óther pathologies, some patients, such as Lamarckism, are slowly recovering. Another wing is preparing rooms for the Big Bang and Clovis-First paradi gms.

COLD FISSION?

That's right: "físsion" not "fusión." A recent number of Science News carries an intriguing suggestion from J. Brind:

> Has anyone considered the possibility that the anomaly of "coid fusión" experimente---high energy yields ^ with few neutrons or tritium nuclei — might result from a case of mis- taken identity? There are a number of nuclear fjssion reactions that produce neither neutrons ñor tritium, yet yield large quantities of energy.

One such reaction is:

$^{7}Li + \% = 2(^{4}He) + 17.3\ MeV.$

This is a very clean nuclear reaction that might one day be harnessed for everyday use, given lithium's low cost and abundance. The "coid fusión" effeets could well come from captures of deuterons by ®Li, which is present in natural lithium.

(Brind, Joel; "Coid Fission?" Science News, 137:163, 1994)

10 YEARS OF COLD FUSION

It was on March 23, 1989 that M. Fleischmann and S. Pons announced their "cold-fusion" results. After an initial surge of publicity followed by disbelief and ridi- cule, coid fusión research was effectively banned from mainstream Science publica- tions. (See foregoing Ítems.)

While coid fusión may not be politically correct these days, a cadre of off-mainstream researchers is pursuing the idea under such ñames as Low-Energy Nuclear Reactions (LENR) and Chemically Assisted Nuclear Reactions (CANR)
Could LENR and CANR (nee CF) be both scientifically correct and politically incorrect?

A survey of coid fusión research over the past decade by E.F. Mallove appears in a recent issue of Infinite Energy.
If you read only mainstream journals, you may be surprised to learn that several thousand technieal papers have been written on the subject. Mallove has abstracted a "select 34" of these that support the reality of LENR and CANR. Many of the 34 appeared in Infinite Energy and Fusión Technology. The Journal of Electroanalytical Chemistry and Physics Letters A have also carried some of these "select" papers.

Finally, Mallove provides references to papers that undermine the credibility of those studies at Caltech, Harwell, and MIT that were used to derail coid fusión as a serious scientifie enterprise.

(Mallove, Eugene F.; "Key Experimente That Substantiate Coid Fusión Pheno- mena," Infinite Energy, 4:29, March- April 1999)

RADIOACTIVITY

HIGH TEMPERATURE SUPPRESSES RADIOACTIVE DECAY

Environmental conditions are not supposed to affect nuclear reactions in general or radioactive decay rates speci- fically. This is one reason why coid fusión got the coid shoulder from most physicists. Now for the "however" that is the hallmark of Science Frontiers:

> Thirty years ago, Otto Reifen- schweiler was searching for a com- pound which could protect Geiger- Mueller tubes from damage when they are flrst ionised. He found the com- pound, which became a money-spinner for Philips, in a mixture of titanium and radioactive tritium. He also dis- covered that as the mixture was heat- ed, its radioactlvity declined sharply. No process known to physics could account for such a baffling phenomenon: radioactivity should be un- affected by heat. Nevertheless, as the temperature increased from 115°C to 160°C, the emission of beta parti- cles fell by 28%.

Reifenschweiler and his colleague, H. Casimir, put this discovery on the back-burner and concentrated on the Geiger-Mueller tubes. The recent furor over coid fusión impelled them to resurrect the work and publish it in tlie January 3 issue of Physics Letters A. Is there a new phenomenon here? Is it relevant to coid fusión? It may be pertinent that some common fusión reactions also em- ploy tritium.

(Bown, William; "Ancient Experiment Turas Heat Up on Coid Fusión," New Scientist, p. 16, January 8, 1994)

Comment. How many other potential anom alies simmer neglected on backburn- ers, while their discoverers focus upon more acceptable and profitable things?

ANCIENT MODERN LIFE AND CARBON DATING

Pursuant to the possible effect of the earth's recent envelopment by a molecular cloud on the accuracy of carbón dating (p. 301), we now look at the potential distortion caused by the ingestión of primordial carbón (carbon-13) by plants and animáis • Primordial carbón may come from limestone or natural gas welling up from the earth's interior. Modera life forms that metabolize primordial rather than atmospheric carbón dioxide, with its cosmic-ray produced carbon-14, will appear extremely oíd when carbon-dated.

For example, M. Grachev et al carbon-dated flatworms and a sponge collected from a bacterial mat near a ther-

mal vent 420-meters deep in Lake Baikal. The apparent ages of these living organ- isms ranged from 6860 to 10,200 years.

(Grachev, M., et al; "Extant Fauna of Ancient Carbón," Nature, 374:123, 1995)

Even animáis eating these apparently ancient life forms may take up their carbon-13 and, in effeet, be drained of carbon-14. They would appear to age rapidly. Such false aging has actually been induced in the laboratory with mice fed on brewer's yeast grown in natural gas. These mice, living in cages at Lawrence Livermore National Labora- ≤tory, California, were carbon-dated as being 13,000 years oíd, and were ex- pected to attain a ripe oíd age of 35,000 in a few months. (All this was part of a cancer-research project.)

Of course, most carbon-dating in archeology is not endangered by the primordial-carbon problem. But, as K. Turteltaub, "father" of the Lazarus mice, commented:

> We've joked about sprinkling them Tthe mice] around archeological sites just to confuse everyone.

(Weisman, Jonathan; "Of Lazarus Mice and Carbon-14," Tri-Valley Herald, July 12, 1993. Cr. R. Berg.)

MICROBES THREATEN RADIOCARBON DATING

In the 1980s, skeptics had a lot of fun debunking the Shroud of Turin, the supposed burial cloth wrapped around Christ. Their glee was unbounded when radiocarbon dating "proved" that the shroud could not be older than 700 years. The skeptics may have been too quick to celébrate, because the samples that were sent to the radiocarbon lab may not have been wholly cloth.

The reality of our biosphere is that virtually everything is permeated with microbes and their producís. S.J. Mattingly and L.A. Garza-Valdes, of the University of Texas at San Antonio, have been studying "biogenic varnishes" for years. These plastic-like coatings are produced by bacteria and fungi. Sure enough, microscopio examination of a few Unen fíbers from the Shroud of Turin show that they, too, are coated with such varnishes. These biogenic varnishes may introduce carbón that has been recently flxed from the atmosphere and thus make the sample's age appear younger than it really is.

(Travis, John; "Microbes Muddle Shroud of Turin's Age," Science News, 147:346, 1995)

Comment. More than the Shroud is at stake here. Bacteria contamínate just about everything, including wood and bone from archeological sites. Bacteria may, therefore, "rejuvenate" samples sent in for radiocarbon dating. The^ importanee of this phenomenon is still unclear.

Cross reference. Radiocarbon-dated samples may also appear erroneously "aged" by the uptake of primordial carbón (C^{13}) present in the earth's crust. See p. 300.

CARBON-14 DATING: DNDER A CLOÜD?

An item in Science News about the earth's envelopment by a cloud of inter- stellar gas 2,000-8.000 years ago im- pelled J.M. Rankin to inquire if this cloud could change the cosmic-ray flux enough to affect carbon-14 dating. The answer seems to be YES. Unfortunately, we do not yet know enough to "make corrections for this gastroastronomical event.

(Rankin, John M., and Frisch, Priscilla C. ; "Carbon-14 Dating: Under a Cloud?' Science News, 147:51, 1995)

PHYSICAL CONSTANTS

IS THE FINE-STRDCTURE CONSTANT INCONSTANT?

Enough philosophy! A team of Aus- traUan astronomers, led by J.K. Webb, has been trying to determine if the famous fine-structure constant of physics has really remained constant throughout the 12-bilUon years or so of the uni- verse's history. The fine-structure constant is dimensionless and almost exactly equal to 1/137. (Why 137? That's another question!) Anyway, the AustraUans got a good fix on the constant's valué 2 bil- Uon years ago by measuring the composi- tion of the nuclear waste produced by the Olko natural nuclear reactors in Gabon, Africa. It hasn't changed since then. The spectra of distant quasars 7 bilUon years oíd also signaled no change. But more-distant and, therefore, sup- posedly older, gas clouds have suggested that a sUghtly smaller fine-structure constant held sway then. No known experimental error can account for this difference.

> If confirmed, would Webb's findings eventually be explained by a deeper theory, vindicating physicists' faith in a uniform nature? Or would they mean that we live in a frighteningly arbitrary and variegated cosmos, where huge swathes of space abide by alien principies?

(Musser, George; "Inconstant Constante,ʳ Scientific American, 279:24, November 1998)

Comment. Even as we write, some distant part of the cosmos may be coming into estrus for life-as-we-do-not-know- it. See vol. 1, p. 88 for "Already, now, we are forgotten on those stellar shores.'

G: THE EMBARRASSING CONSTANT OF NATÜRE

' Of the four fundamental forces of nature, gravity was the first to be discovered. Even the Neanderthals knew of it! That's hardly surprising; it's everywhere. Unfortunately, we don't know much more about it than the Neanderthals. Though it seems powerful when you trip and fall, gravity is the weakest of the fundamental four. In a helium nucleus, the forcé of repulsión between two protons is UP” times the gravitational attraction between them. Weak though it may be, gravity controla the trajectory of a baseball, the motion of the planets, and the shape of our Galaxy.

Physicists describe gravitation with Newton's Law of Gravitation, which incorporates the Gravitational Constant G. Here's where the embarrassment arises. Many other constants of nature, such as the charge on the electrón, are known to eight signiñcant figures. We only know G to three, What's worse, modern attempts to refine the measurement of G come up with wildly different answers. Torsion-pendulum experimenta in the U.S., Germany, and New Zealand are far apart in their G-measurements. And physicists are perplexed —to put it mildly.

Of course, G is hard to measure. Seismic waves from ocean surf hundreds of miles away can affect the experiments. If a colleague a few offices away brings in some boxee of books for his library, the experiment is compromised. Better instrument science may eventually re- solve the too-large discrepancies between the measured valúes of G, but some physicists worry that perhaps the problem runs deeper.

> If experiments find that G is changing slowly over time, for example, physicists would have to rethink how space and time are stitched together in a single fabric. Einstein would groan in his grave.

(Kestenbaum, David; "The Legend of Big G," New Scientist, p. 39, January 17, 1998)

QUANTUMMECHANICS

QUANTUM MECHANICS IS DEFINITELY SPOOKY

> I cannot seriously believe in [the quantum theory] because it cannot be reconciled with the idea that physics should represent a reality in time and space, free from spooky actions at a distance. (Ref. 1)

So Einstein wrote Max Born in March 1947. Well, even Einstein could have been wrong!

> It's getting even spookier out there. Partióles can be strangely connected over at least ten kilometres, accord- ing to results from physicists in Geneva. Using pairs oí "entangled" photons, Nicolás Gisin and his col- leagues from the University of Geneva have shown that the measurement of one partióle will instantaneously determine the state of the other. (Ref. 2)

This particular spooky aspect of quantum mechanics was demonstrated 15 years ago over a distance of just a few meters. Many physicists had expected (probably "hoped") that this "mysterious link" between separated partióles would weaken with distance. But this quantum- mechanics effect does not conform to "eommon-sense" expectations! Now it seems that one partióle of an "entangled pair" knows instantaneously what its mate is doing, possibly even if it is located on the other side of the universe.

More quantum-meehanics spookiness is seen in "tunneling" phenomena, such as that mentioned on p. 303, where a Mozart symphony zipped through a bar- rier at 4.7 times the speed of light.

Physicists do acknowledge these counter-intuitive quantum-mechanics effects, but they are not comfortable with them. Some, on the other hand, embrace them. The late physicist H. Pagels maintained that quantum mechanics is a sort of "code" that ties together every- thing in the cosmos. He explained all this in his book The Cosmic Code. (Ref. 3)

(Ref. 1. Watson, Andrew; "Quantum Spookiness Wins, Einstein Loses in Pho- ton Test," Science, 277:481, 1997.
Ref. 2. Buchanan, Mark; "Light's Spooky Connections Set Distance Record," New Scientist, p. 16, June 28, 1997. Ref. 3. Browne, Maleolm W.; "Far Apart, 2 Partióles Respond Faster Than Light," New York Times, July 22, 1997. Cr. M. Col- pitts.)

Comments. "Spookiness" is in the mind of the percipient. We don't usually think of gravity as spooky, but just what does draw two masses together? All action-at- a-distance forces are spooky.

Everybody is into "codes" these days, as if Nature herself (or God) is not speaking out directly and plainly. We have, for example: The Message of the Sphinx (G. Hancock and R. Bauval);
The Bible Code (M. Drosin); and The Biotic Message (W.J. ReMine).

MORE QUANTUM WEIRDNESS

You have probably already heard how a change in one subatomic partióle can cause an instantaneous change in another, even if the second partióle is cruising along in another galaxy. That's quantum weirdness all right, but this weirdness can also produce effects we can see and hear.

AR you have to do is cool helium down to almost absolute zero. It will liquify but, unlike most other gases, it will not freeze. You are surprised at this, of course. Now, if you spin a bowl of this liquid helium around, you will be astounded. The liquid remains absolutely stationary in its spinning container---no centrifugal effects, no friction with the contained wall, nada!.

However, the strangest part comes' when you:

> Draw a cupful out of the bowl, sus- pend it a few centimeters above the remaining liquid, then stand back and rub your eyes—the fluid in the cup will cheat common sense by pour- ing itself, drop by drop, back into the bowl. A drop climbs up the in- side of the cup, then runs down the outside. When it falls, another be- gins climbing, and the magie continúes until the cup is dry.

(Brooks, Michael; "Liquid Genius," New Scientist, p. 24, September 5, 1998)

FOREVER TOGETHER

The entanglement phenomenon condoned by quantum mechanics is about as weird as physics can be, perhaps as weird as alien abductions or filigree crop circles.

One would certainly expect the bond (whatever that may consist of) between a pair of entangled photons would be broken if they plowed through tiny holes in a metal barrier.

But E. Altewischer et al fired a pair of entangled photons at a gold foil peppered with holes 200 nanometers wide. These holes were too small for the photons to squeeze through, but, upon contact with the gold surface, the photons created electrón waves that could squeeze through the holes. These waves re-emitted the photons on the other side of the foil. The reborn photons were also entangled.

Thus, the finest of metal screens cannot filter out "fat" photons or even sever their bonds of entanglement.

(Anonymous; "Tough to Untangle," New Scientist. p. 24, July 20, 2002.)

THE SPOOKINESS OF IT ALL

Physicists have always admitted that quantum mechanics is pretty spooky. When an innocent, flesh-and-blood cat can exist in two states at the same time, that is something for the X-Files of science.

Apparently the discipline of cosmology now has a really spooky situation to deal with. Recently, a series of observations of distant quasars suggests that the so- ealled "fine-structure constant" was slightly different 12 billion years ago.
This is seen in the observation that 12-billion-year-old atoms of iron and manga- nese absorbed energies in different quantized amounts than they do today.

Now, the fine-structure constant is concocted from three other constants of nature, including the charge on the electrón and the speed of light. If the fine-structure is variable, so might be its constitents—and that is worrisome. Cosmologists and physicists are not too happy with ineonstant constants.
T. Banks, for example, gives a un- specific but far-reaching prediction:

> If these observations are confirmed, one will have to invent some very exotic physics to explain them.

M. Dine's thoughts are a bit spookier:

> Some sort of surprising------and current- ly unknown—physical mechanism or principie must be at work.

(Brooks, Michael; "Blinding Flash," New Scientist, p. 28, May 11, 2002)

Comment. It seems that things are also getting spookier at the biochemical level. While the concept of "intelligent design" is being trashed for its religious innuen- does, one can objectively see------dimly— in the way life forms manipúlate and store information the possibility that information sources of higher order than the genome exist and opérate in cells. When we find out what these are, we suspect that they, too, will be spooky but hardly super- natural.

FALLING IN A QUANTIZED WAY

Apparently, quantum gravitational states have been observed for the first time. The experimental objects falling in re- sponse to the earth's gravitational field were coid neutrons. They didn't accel- erate smoothly like a high fly descending in a baseball park seems to fall, but rather jerkily in velocity steps of 1.7 centimeters/second. In other words, a neutrón falling at 10 centimeters / second under the influence of gravity instan- taneously accelerated to 11.7 centimeters/ second, then to 13.4 centimeters/second, and so on.

(Van Flandern, Tom; "Possible Detection of Gravitational Quantum," Meta Research Bulletin, 11:16, March 15, 2002)

Comment. No wonder some pitches are hard to hit!

LIGHT MUSIC BY MOZART

Waveguides are metal tubes used for transmitting microwaves. They are seen commonly In radars and communication equipment, In normal usage, electromagnetic waves zip tbrough waveguides at just under the speed of light. But in 1992, G. Nimtz and colleagues at the University of Cologne claimed that they had transmitted microwaves through waveguides faster than the speed of light.
In fact, at a scientific meeting in Snow- bird, Utah, in 1995, Nimtz announced that his team had transmitted Mozart's 40th Symphony across 12 centimeters of space at 4.7 times the speed of light!
He even had a recording to prove it, or so he thought.

Strange as it may seem, quantum mechanics does allow electromagnetic waves to pass through barriers at super- luminal velocities. The phenomenon is termed "tunnelling." This can occur in waveguides when the cross section of the waveguide is too small to accommodate a complete number of half-wavelengths.

This permissiveness of quantum mechanics thus seems to collide head-on with Einstein's Special Theory of Rela- tivity, which is the basis for the popular belief that "nothing can travel faster than light." Which is correct: quantum mechanics or Special Relativity? Both theories are supported by many observa- tions. One way out of this dilemma is to assert that Special Relativity really says that no "signal" can travel faster than light. Some participante at the Snowbird conference immediately declared that Mozart's 40th Symphony was not a signal at all! (Mozart lovers are sure to object!)

The debate continúes. After all, we could viólate causality (cause-and-effect) if we could transmit signáis faster than light.

(Brown, Julián; "Faster than the Speed of Light," New Scientist, p. 26, April 1, 1995)

OPTICS

MORE LIGHT AT THE END OF THE TÜNNEL

It would certainly be termed anomalous if light were shown on a screen perfor- ated with holes and more light emerged on the dark side of the screen than was incident on the holes on the front side. Although counterintuitive, such a phenomenon can take place.

Of course, the conditions under which holes amplify light are quite special. The theoretical explanation of the effect also remains speculative.

The flrst notice of the amplifieation effect was noticed at the NEC Research Institute in Princeton in 1989. T. Ebbe- son exposed gold foil pierced with more than 100 million holes, each about 300 nanometers in diameter (l/200th the diameter of a human hair). Being smaller than the wavelength of the incident light, optical theory predicted that only 0.01% of the light would pass through the foil. Instead, more than 100% of the incident light streamed through!

The explanation of this unexpected development focuses on the gold-foil surface. This surface, it is theorized, is not solid but rather a churning two- dimensional sea of electrons. The waves of this electrón sea are called "plasmons." If the holes in this sea (the foil perfora- tions) are of the right size and the incident light of the right wavelength, the plasmons will resonate, thereby absorbing most of the energy of the light. The plasmons concéntrate around the perfor- ations, creating intense electrical fields that penétrate the thin gold foil and excite plasmons in the electrón sea on the dark side. The induced plasmons reemit the light absorbed on the lighted side. In effect, light energy from all over the the lighted side pours through the holes. Thus, more light energy passes through the perforations than impinges upon them.

(Schechter, Bruce; "Bright New World," New Scientist, p. 31, April 26, 2003.)

GRAVITATION

A RECIPE FOR WEIGHTLESSNESS?

(1) Take fifty rings of a superconducting ceramic, 27.5 centimeters in diameter, and stack them one above the other.

(2) ChiH rings to -334°F.

(3) Spin rings at 3,000 rpm.

You now have an antigravity machine; any object positioned above or below the rings wül be weightless!

This recipe is based on a claim by Finnish scientist E.E. Podkletnov at the Tampere University of Technology. Podkletnov discovered this amazing effect when researching superconducting materials, However, he used^ only a single ring, which resulted in a 2% weight reduction. Since antigravity effects are probably additive, it seems reasonable that flfty rings will create a 100% weight reduction. Obviously, more than fifty rings will be required to launch spacecraft from earth!

Sure, it's a wild claim, but NASA is checking it out at the University of Alabama in a project headed by N. Li.

(Holden, Constance; "NASA's Fling with Antigravity," Science, 274:183, 1996. Also: Port, Otis; "Take That, Isaac Newton," Business Week, p. 42, Septem- ber 30, 1996. Cr. E. Murphy.)

Comment. Facetiousness aside, it is pertinent to add here that physicist P.M.S. Blackett once seriously hypothesized that a magnetic field is generated by a rotating mass, such as the sun.

WARNING

CARS ROLLING UPHILL AHEAD

In reply to a query, the New Scientist received a delightful assortment of replies related to "magnetic vórtices" and other places where gravity seems to be reversed. At such places, car drivers can stop, put the car in neutral, reléase the brakes, and the car will seem to roll uphill. Some of the spots men- tioned were:

•On route A719, in Ayrshire, there are "special warning signs because of the likelihood of meeeting cars coasting uphill backwards, as baffled drivers are confused by their senses."

•Near Neepawa, Manitoba, one finds a road named Magnetic Hill.

•Northern Portugal. Here, bikers have to pedal hard to go downhill!

•Lake Wales, Florida, is the location of Spook Hill, described in vol. 1, p. 203.

•Other locales: near Hanging Rock, Australia; the island of Cheju Do, off the South Korean coast..

At some of these spots, surveying Instruments have been brought in, and without exception the rever sal of gravity has been shown to be illusory. Sorry folks, there are no magnetic vórtices!

(Various; "Sloping Off," New Scientist, p. 85, February 25, 1995)

RELATIVITY MORPHIC RESONANCE CHAOS

EINSTEIN IN FREE FALL

We now describe two abstruse phenomena, one of which is well-recognized, the other which is suggested by quantum mechanics, but is yet unobserved. Both involve only tiny physical effects. Even so, we should remember that a linchpin of Special Relativity is the tiny advance of Mercury's perihelion. It was Mer- cury's miniscule orbital anomaly that helped overthrow Newtonian celestial mechanics. Now, quantum mechanics may, in turn, undermine Relativity. The gist of this introduction is that we have here tiny, hard-to-visualize phenomena that are so scientifieally important that it is worthwhile trying to understand them.

In the first abstruse phenomenon, quantum mechanical effects demónstrate that the laws of elassical electromagnetism are flawed. According to the elassical view, an electrón cruising by an ideal solenoid (a tube with an internal magne- tic field but none outside) should be unaffected; that is, the electrón should not "feel" the confined magnetic field. But, in the quantum mechanical view, the "presence" of the electrón is smeared out so that it penetrates the solenoid, and the electrón is affected by the confined field. This has been demonstrated.

A Los Alamos scientist, D. Ahluwalia, ventures that an analogous situation pre- vails with gravity. He notes that General Relativity prediets that a particle (or person) in free fall cannot distinguish this condition (weightlessness) from the situation in a hollow shell of matter, where the gravitational field is cancelled out. A person would feel weightless in both situations.

But the strange part arises when one looks at the two situations from the perspective of quantum mechanics; that is, one puts gravity into Shroedinger's equation. Ahluwalia asserts that the particle's (or person’s) gravitational presence is smeared out, just like that of the electrón outside the solenoid. In consequence, masses can "feel" their gravitational potential and will behave differently in free fall than when inside a hollow sphere, contrary to what Ein- stein maintained in his General Relativity .

(Seife, Charles; "Einstein in Free Fall," New Scientist, p. 11, June 13, 1998)

Comment. Like the princess who felt the pea beneath her pile of matresses, this tiny quantum mechanical effect, if ex- perimentally verified, could undercut Relativity, which is a foundation stone of our modern philosophical outlook. Bizarre as many predictions of quantum mechanics are, they are usually verified experimentally.

DOES THE PAST INFLDENCE THE FÜTURE?

R. Sheldrake's theory of morphic re- sonance answers this question affirma- tively. For example, it prediets that once a Chemical compound is synthe- sized it will be easier to synthesize it again in the future because the com- pound's "morphogenetic field" will "guide" the Chemical processes along paths already established. Can you won- der why mainstream Science advised that Sheldrake's book, A New Science of Life, be BURNT!

Well, there was a lot of smoke but the theory survives. Nature, in fact, is full of observations, such as parallel evolution, that support the idea of morphic resonance. And in the labora- tory, a few brave souls are conducting experiments that seem to confirm the theory more directly.

> üsing a novel laboratory approach, researehers at Yale University have been able to create a morphogenetic effect after stimulating only 100 sub- jeets. They employed a series of trivial paper-and-pencil tasks (such as "Put an X in any one of the four boxes shown below"). Experimenters tallied how an initial group of 100 students responded to these tasks. Then they forced a second group of 100 students to respond to the tasks in a set manner ("Put an X in the third box below"). Finally, they pre- sented the same tasks to a third group of 100 students, allowing them to complete them, as with the first group, however they wished.

Results showed that in one task the third group had been unknowingly influ- enced by what the second group had been forced to do! This was interpreted as evidence of morphic resonance.

(Anonymous; "New Evidence for Morpho- genetic Field," Venture Inward, p. 10, September/October 1994.)

Comment. There can be no doubt that morphogenetic fields do exist. Ever since they first made the pages of Science Frontiers in 1981 (vol. 1, p. 132), we have felt an uncanny urge to publish another Item, and anotlier, and another, and another.....

CHAOS AT THE AMÜSEMENT PARK

Readers of Science Frontiers are weU aware that some denizens of our solar system exhibit chaotic motion, as do some pendulums and even dripping fau- cets. Chaosists seem to be able to find chaos everywhere they look.

If you have ever ridden on that amusement park staple caUed the Tilt-A-Whirl, you will recaU that the ride is fun because you never know exactly what the car you are riding in wiU do as the platforms move along the hilly circular track. Each car is free to rotat< about its center and wül also tilt in all possible directions as the cars go up and down the hills. Can one mathemati- caUy predict whether the car wiU spin clockwise, counterclockwise. or not at all? What a neat problem for a physicist!

And two physicists, R.L. Kautz and B.M. Huggard, have developed a mathe- matical model of the Tilt-A-Whirl. By integrating the equation of motion, they find that the Tilt-A-Whirl is, indeed, a chaotic system. You really cannot teü what the car is going to do-------even if you take your laptop along with you!

(Kautz, R.L., and Huggard, Bret M.; "Chaos at the Amusement Park: Dynamic of the Tilt-A-Whirl," American Journal of Physics, 62:59, 1994)

THE BIG PICTURE

THE GREATEST UNANSWERED QUESTIONS OF PHYSICS

Above you see the title of an article in the. February 2002 issue of Discover. Th article's subtitle promises a lot:

> Resolution of these profound ques- tions could unlock the secreta of existence and deliver a new age of Science within several decades.

Of the eleven profound questions offered in Discover. four are identical to four of "The 8 Greatest Mysteries of Cosmology" served up in the June 2001 number of Astronomy. (p. 98)

Here foliow in paraphrased form the seven nonduplicates from Discover:

*How were the elementa heavier than iron synthesized?

•What is the source of the ultrahi; energy cosmic rays?

•Are present theories of physics applicable at very high temperatures and pressures?

«Do new states of matter exist at high temperatures and densities?

•Are protons atable?

•What is gravity?

(Haseltine, Eric; "The Greatest Unan- swered Questions of Physics," Discover, 23:36, February 2002)

Comments. Neither the Discover ñor Astronomy lists address the problema mentioned by Hoyle et al mentioned on p. 85. But then Hoyle et al swim far from science's mainstream, while the writers for Astronomy and Discover would not want to stir the deeper waters.

Also signiflcant—from our point of view----is the stark narrowness of the unknown seen in all three lists. So far, in our twenty catalog volumes, we have identified about 2,000 anomalies, some profound, some less so. Of course, in addition to astronomy and physics, we have trawled the waters of biology, geo- l°ÉTy, geophysics, and archeology where much is also unknown. We have in our files some 2,000 more anomalies still-to-be- published. These are mostly in the fields of biology, psychology, chemistry, and physics.

IS MATTER INFINITELY DIVISIBLE?

Just over a year ago, particle physicists at the Fermi National Accelerator Labora- tory (Fermilab) announced that they had at last found the top quark, the final particle needed to flesh out the so-called Standard Model of subatomic physics.
Then, all seemed serene in the world of quarks and gluons. Quarks, you see, are held to be the smallest building blocks of matter and now they had all been found and caíalo ged. The eollection was complete.

But a storm cloud has now appeared on the event horizon, casting a shadow on the solidity of the quarks themselves. Are they realiy fundamental; that is, indivisible? Fermilab seientists now won- der, for when they crash protons into antiprotons head-on at very high ener- gies, the resulting debris clouds dis- play an anomaly. Some of the supposedly indestructable quarks seem to have frag- mented, too. The collision energies seem high enough penétrate the integument of the quarks if they are divisible. There may be other explanations of the devia- tion from theory, but right now quarks seem a bit more fragüe than they did just a few months ago.

(Wüczek, Frank; "A Crack in the Standard Model?" Nature, 380:19, 1996.
Walker, Gabrieüe; "The Secret Heart of a Quark," New Scientist, p. 17, February 17, 1996)

Comment. If quarks can be split , per- haps their fragmente can, too. Do any fundamental partióles realiy exist? Who knows? We started a couple millennia ago with earth, air, fire, and water.
We then found atoms, then protons, then quarks. There may be no floor to the universe; it's quicksand all the way down. There may be no roof either, be- cause astronomers are finding ever lar- ger clumps, skeins, and assemblages of galaxies. Matter could be infinitely ag- gregative as well as infinitely divisible.

TEN MYTHS OF SCIENCE

We have at hand a lengthy paper bearing the above title. It is copyrighted with ominous warnings about quotations. So, we wül paraphrase a lot. The signifi- cance of the article is so great that we daré to quote the first sentence:

> This article addresses and attempts to refute several of the most wide- spread and enduring misconceptions held by students regarding the en- terprise of Science.

We now paraphrase the ten myths of Science, as recognized by W. McComas of the School of Education, University of Southern California. McComas analyzes each "myth" in depth, explaining why it is not a "truth."

Myth 1. Hypotheses turn into theories which eventually become enshrined as laws.

Myth 2. Hypotheses are realiy only edu- eated guesses.

Myth 3. There exists a scientific method that is general and universal.

Myth 4. Certainty results when facts are accumulated and analyzed.

Myth 5. The scientific method leads to absolute truth.

Myth 6. Science is less Creative than it is procedural.

Myth 7. All questions posed by the universe can be answered via the scientific method.

Myth 8. High objectivity is the hallmark of Science.

Myth 9. Scientific knowledge is based mainly on experiment.

Myth 10. Seientists always review and check the work of their colleagues.

(McComas, William; "Ten Myths of Science: Reexamining What We Think We Know...," School Science & Mathematics, vol. 96, January 1, 1996. Cr. M. Truz- zi.)

Comment. The upshot of McComas' analy- sis is that Science is not what it elaims to be.

CAN WE EXPLORE HYPERSPACE?

Anyone who watches Star Trek knows that the universe has more than four dimensións (3 of space, 1 of time). Spaceships are always whisking off into hyperspace. But can we prove that more than three spatial dimensions exist?

Shu-Yuan Chu, University of California at Riverside, has shown theoretically that in a five-dimensional world (4 of space, 1 of time) electric charge need not be conserved. This opens up an experimental avenue to test for an extra spatial dimensión.

For background, recall that physicists originally maintained that mass and energy had to be conserved separately. Then, Einstein carne along to show that mass and energy could be interchanged, via E = mc“, but that they had to be conserved together. In Shu-Yuan Chu's five- dimensional universe mass and charge can be interchanged, but their sum must be conserved. In other words, there exists an E = me^ equivalent for mass and charge in five dimensions. We could look for this extra spatial dimensión by looking for a particle that can be converted into another particle with the same mass + charge, but made up of a different combination of mass and charge. If such reactions exist, we may be able to explore hyperspace in fact rather than in Science fiction.

(Gribbin, John; "Can Electric Charge Be Destroyed?" New Scientist, p. 16, Octo- ber 5, 1994)

WHAT REALLY LIES BENEATH IT ALL?

> What are the fundamental building blocks of the universe? Once we were told they were atoms. Then it turned out that these were not fundamental at aü, but made of protons, neutrons and electrons. Protons and neutrons in turn are made of quarks. Deeper stiü, we now learn, come tiny vibrating strings and membranes living in a space of 1Q or 11 dimensions. But we all expect that one day physicists will finally discover the deepest structures of nature. Won't they?

Nobel lauréate R. Laughlin asserts that the deeper structures of matter----- far deeper than quarks and vibrating strings----are actuaüy beyond human ken. Laughlin contends that "what we caü reality is a spontaneous phenomenon, emerging like a wave out of some forever unknowable cosmic médium."

Of course, the reductionists deny this. They say that if they had big enough machines they could get to the bottom, right down to the basic stuff of the universe. But is there realiy a bottom?

If there is, Laughlin, says it is unknowable, which even more depressing to a scientist than bottomlessness.

Nevertheless, we can play around with these emergent properties, measure them, draw Computer models of them, but we'U never—in a scientific sense— know God; that is, everything!

(Samuel, Eugenie; "What Lies Beneath," New Scientist, p. 24, February 9, 2002)

Comments. [1]

(1) Laughlin seems overwhelmed by the bottomlessness of the microworld. But future humans or other entities may someday drül down to the "basement rock" of reality. Some may already have!

(2) Laughlin was looking downscale, but the same situation prevails upseale in the macroworld. First there was the solar system; then carne galaxies; next were múltiple universes; followed by colliding branes. It is all too apparent that reality may also be topless, filled with ponderous, ever larger structures.

(3) All this based upon the assump- tion of three spatial dimensions and time!

IT'S TIME FOR SOME BOLD GENERALIZARON S

No one can contest that quantum mechanics has been extremely successful in deseribing the phenomena of physics. This fact does not mean that it is easy to understand. In fact, there are eight competing "interpretations" of quantum mechanics, none of which is completely convincing. No wonder, because quantum mechanics implies four characteristies of the universe that are seriously at odds with our everyday experience:

- The quantization of the properties of matter;
- The probabilistic nature of physical measurements;
- Entanglement; that is, the mysteri- ous instantaneous connection of ob- jects and processes across immense distances; and
- Superpositionj for example, an electrón is both here and there untii we look at it!

A. Zeüinger, University of Vienna, advances the idea that we can truly understand quantum mechanics only when we discover an underlying principie------ something akin to the concept of energy which led to the quantification of the laws of thermodynamics. (Incidentally. we only think we know what energy is, but it is a human construct and is not a physical dimensión like mass or distance.)

Zeilinger asserts that the underlying principie of quantum mechanics is the quantization of Information. Every in- quiry Science makes into the nature of the universe, says Zeilinger, can be reduced to a yes-or-no question; i.e., a 1 or 0. To a scientist, nature is really like a person on a witness stand being hammered by a prosecutor with yes-or-no questions. In other words, nature appears quantized because our knowledge óf it is quantized.

(von Baeyer, Hans Christian; "In the Beginning Was the Bit," New Scientist, p. 26, February 17, 2001)

Comment. It follows, we presume, that if information were not quantized and were, say, analog in nature, the universe would look entirely different.

theory for the origin of the universe prediets that clumps of galaxies of all sizes were created early on. This is not what a survey by S. Sarkar et al, at the University of Oxford, found. A split second after the Big Bang, galaxies were organized in structures about 300-million light years across. The standard model of partióle physics cannot account for this preferred size. The theorists' re- course is a phase ehange, a point in time when the warp and woof of the universe changed; that is, ehange the rules until they fit.

(Chown, Marcus; "In the Beginning," New Scientist, p.7, April 25, 1998)

Comment. Hang onto your hats. If a phase ehange happened once, it can happen again. Things may faR up tomorrow. See vol. 1, p. 329, for Ítem entitled: "Repent! The Phase Change is Corning."

IS NOTHING CERTAIN ANYMORE?

It was discouraging enough to learn that many natural systems, from simple pendu- lums to our weather, are basically chao- tic; that is, tiny changes in the initial conditions upon which predictions are based can lead to highly unpredictable outeomes. Chaotic systems are usually qualitatively predictable but not quanti- tatively predictable. We have no choice but to live with this chaos; it seems that that's the way the cosmos is constructed! However, it now seems that the situation is even worse than chaotic! Some systems, perhaps most systems, are also indeterminate, meaning that we cannot predict their qualitative behavior either. A simple example is the water swirling down the bathtub drain. This is not only chaotic but it has two qualitative final States: clockwise and counterclockwise. Regardless of which hemisphere you are in, you can change the direction of swirl with negligible effort. Each of the two final states of motion is still quanti- tatively unpredictable. Systems that are more complex will possess many different final states, all chaotic. Can nature really be fundamentally chaotic as well as qualitatively uncertain?

J.C. Sommerer and E. Ott have mathematically examined a relatively simple system consisting of a single partióle moving in a forcé fleld, experiencing friction, and being periodically jolted. Besides settling into chaotic motion, this particle may also be forced away to infinity----two radically different final states. The analysis revealed that for any set of initial conditions leading to the fírst type of behavior, there was an infinite number of slightly different initial conditions that would lead to the second type of behavior. In other words, systems that we have long thought to be deterministic, like the motions of the planets, may be not only chaotic but indeterminate.

Since Sommerer and Ott found their indeterminate system easily, we must face the possibility that the future behavior of just about everything is beyond our capability to predict, even with our best instruments and compu- ters. Apparently the universe is built in such a way that exact Science is im- possible.

(Sommerer, John C., and Ott, Edward; "A Physical System with Qualitatively Uncertain Dynamics," Nature, 365:138, 1993. Peterson, I.; "Finding Riddles of Physical Uncertainty," Science News, 144:180, 1993)

Comment. This discovery is even more profound than Heisenberg's Uncertainty Principie, which is merely quantitative in character and for practical purposes rules only the atomic world. From the above we see that the entire cosmos is uncertain quantitatively and qualitatively. A heck of a way to construct a universe!

MISCELLANY

THE DAY THE LAWS OF PHYSICS CHANGED

Well, maybe there weren't such tliings as "days" as we now know them back when the universe was very young. In fact, "time" then might have been different from "time" now. This sounds like so mueh physics-speak; but, seriously, during the birth pangs of the universe, there seems to have been what cosmolo- gists cali a "phase ehange," a mysterious moment when the laws of physics sudden- ly became more complex. You can reason- ably ask: "How can supposedly immu- table physical laws ehange?" The answer seems to be that anything can happen when something is being made from nothing!

This apparent plasticity in the laws governing the cosmos is suggested by observations of how galaxies in the early universe were distributed. The standard

REAL PERPETUAL MOTION?

Physicist R.A. Webb and coworkers magnetically induce electrical currents in tiny gold rings at the University of Maryland. The ring temperatures are low but not in the superconducting range. Magnetic induction of electmelty is of course perfectly allowable in physics. What is not theoretically permitted is for tiny currents to persist long after the magnetic field has been turned off. The currents are small, only 10“⁶ of an ampere; but, they are there, and they shouldn't be.

(Lipkin, Richard, and Travis, John; "Electric Currets That Merely Flow," Science News, 149:126, 1996)

Comment. If you conceive of electrical currents as mists of palpable electrons circulating around inside those gold rings, the situation does resemble perpetual motion. The referenced item is brief and not fortheoming on such mat- ters. Do the currents eventually die out? Will any metal work? Does the phenome- non appear at room temperature?

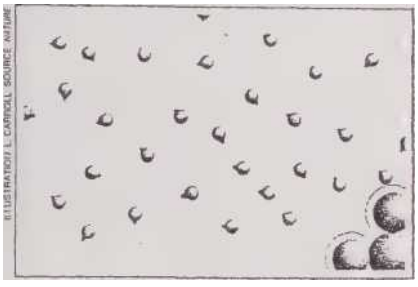
MORE DISORDER HERE PRODUCES ORDER THERE

Physicists use the word "entropy" to describe the well-observed tendeney of the universe to run down; that is, be- come more disorderly. In some situations, though, the increase in disorder (entropy) in one part of the universe can create order elsewhere. For example, if you add tiny plástic spheres of two Bizes to salty water, you will not get a uniform mixture. Instead the larger spheres will pack together into tightly ordered crys- ttíine shapes (representing more order) while the smaller spheres become more

disordered. It is like watching cream unstir itself from coffee. It smacks of magic, but it is all within the laws of thermodynamics.

This strange "forcé" exerted by en- tropy may explain sorue puzzling biologi- cal phenomena, such as the expulsión of nuclei from mamm alian red blood cells before they enter the bloodstream as sacks of hemoglobin. The idea being that the increasing entropy of the prolifera- ting hemoglobin molecules (analogous to the smaller spheres) is maximized when the nuclei (large spheres) are squeezed out of the cells altogether.

(Kestenbaum, David; "Gentle Forcé of Entropy Bridges Disciplines," Science, 279:1849, 1998)



When many smaller spheres .are added lo a group of larger spheres, the "gentle forcé" of entropy "pushes" the larger spheres into a córner.
This represents a State of higher arder.

Commenté. The red-blood-cell example presented in the article is on shaky ground, because while mammalian red blood cells do lack nuclei those of birds and reptiles retain theirs. (See BMC6 in our catalog Mammals II.)

In the above context, the origin of life (more order) anywhere in the uni- verse can be thought to be due to the "gentle forcé" of entropy; that is, the result of increasing disorder elsewhere. See? It's all very simple!!

A REVOLUTION IN ELECTROSTATICS

Quite unexpectedly, the three metal spheres suspended on wires began to spin when A. Wistrom and A. Khachatourian applied D.C. voltage to them. In some way, the electros tatic fíelds applied torques to the spheres, rotating them until they were stopped by the twisting of the supporting wires.

According to a News Release from the University of California at Riverside: "The observed electrostatic rotation was not expected and could not be explained by available theory."

Wistrom is quoted as follows:

> So the discovery of electrostatic rotation and the identification of electro- statie spin as a natural phenomenon opens up an entirely new field of in- quiry with the potential for significant advances.

(Anonymous; "UC Riverside Researchers*1 Discovery of Electrostatic Spin Challenges Century-Old Theory," News Release, Uni- versity of California, Riverside, April 2. 2003. Cr. D. Swaner)

Comment. Although Wistrom and Khacha- tourian have published their "revolution- ary" results in peer-reviewed Applied Physics Letters, we suspect conventional physics may come up with a nonrevolu- tionary explanation of electrostatic spin.
A deep search of the literature also seems in order.

SOUR GRAPES!

Darn! Just when we find an amusing anomaly, someone comes along and de- anomalizes it. Remember the rice grains (See col.3)that sank in a glass of "fizzy" lemonade, then rose to the surface only to sink and rise again—over and over? Well, this phenomenon is hardly new and has a good explanation. We quote from a book first published in 1925. Here, a grape and soda water are employed:

> A grape is not wetted by water, and so when it is put into the tumbler it sinks to the bottom of the soda water, where it eollects bubbles at a great rate. Soon it is covered over with a sheet of bubbles that look like seed- pearls, and these bring it by their buoyancy to the surface. The grape is not much heavier than the water, and does not require much to lift it. At the surface the grape parts with some of its bubbles, which burst into the open air, and this goes on until it sinks again, only to collect a few more bubbles and once more be made buoyant. The procesa will repeat itself continually for many minutes until the soda water is "dead."

(Bragg, William; On the Nature of Things, p. 109, Garden City, 1950.
Cr. A. Mebane.)

WHY DOES SPAGHETTI BREAK INTO THREE PIECES INSTEAD OF TWO?

R. Feynman carried out spaghetti ex- perimenta but did not deign to theorize on why he almost always ended up with three pieces each time he attempted to break a piece in two. Fortunately for Science, O. and R. Nickalls have come up with an answer.

> We can only assume that Feynman was not really trying, since when we investigated this profound and funda- mental problem in our own kitchen laboratory, not only did we quickly establish the underlying mechanism, but we even went on to formúlate the following general rule for linear spaghetti structures:- If a spaghetti stick is uniformly bent until it fractures and ejects a third piece, then . the third piece is always ejected out- wards from the convex side.
>
> When the spaghetti fractures for the first time, the two remaining pieces then spring outwards, and pro- viding there is a sufficiently weak potential fracture site on the opposite side a second fracture occurs, re- sulting in a third piece being ejected away from the initially convex side.

(Nickalls, Oliver and Richard; "Linear Spaghetti," New Scientist, p. 52, 1995)

Comment. We have omitted the mathemati- cal treatment of this complex phenomenon because it involves tensor analysis!

ANOTHER STARCHY ANOMALY

Last issue it was uncooked spaghetti that insisted on breaking into three pieces instead of two. Now, we find that when a grain of cooked rice falla into a glass of fizzy lemonade, it first sinks to the bottom and, then, rises to the top. It sinks again, rises again, and so on. One of N. Hall's rice grains persisted in this yoyo motion for fully 10 minutes! Why?

(Hall, Nicholas; "Bouncing Rice," New Scientist, inside back cover, May 13, 1995)

FUNNY FLUID PHENOMENA

We risk over-alliteration of titles in this issue but cannot resist.

Caffeine thoughts. A. Scholey, a psycho- pharmacologist, told a group of coffee- lovers that they were going to be given either caffeinated or uncaffeinated coffee. He lied! He actually gave half of each of two groups the opposite of what he had promised.

> People who drank normal coffee but thought it was decaffeinated per- formed less weU in tests, while those who thought they'd had caffein but had been given decaffeinated coffee speeded up in the tests. However, they made many more errors.

(Anonymous; "All in the Mind," New Scientist, p. 19, April 29, 2000)

Drunk on nothing. In the past, cook- shacks in Maine logging camps stoeked old- fashioned vanilla extract containing alcohol. However, loggers broke into the cookshacks and got drunk on the vanilla. A switch to alcohol-free extract was futile. The illiterate loggers could not read the new lables, drank the stuff, and still got drunk!

(Berger, Ivan; "Drunk on Nothing," New Scientist, p. 53, May 27, 2000)

Straw power. H. Shiroyama asked the following question in the May 13, 2000, issue of New Scientist:

> I have heard it said that if you drink beer through a straw you will become intoxicated more quickly. Many of my friends have heard it too. Is it an urban myth or true and, if so, why?

Thus chaHenged, the magazine editor conducted an informal test using ten easily found volunteers. Only half used straws; all had plenty of free beer. The five straw- users definitely performed

worse on standard sobriety tests than the glass-lifters, even though both groups consumed the same amounts of beer.

One New Scientist reader eommented that one can get drunk still faster by consuraing beer using a spoon instead of a straw.

In Russia, chimed in another reader, the effect of vodka is greatly amplified if imbibed with a thimble instead of a glass.

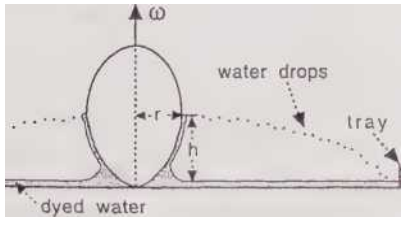
(Shiroyama, Haitsu, et al; "Suck It and See," New Scientist, p. 40, May 13, 2000)

CURIOOS EFFECTS DEPARTMENT

The spinning-egg water-sprinkler. It is generally known that you can sepárate fresh eggs from hard-boiled eggs by spinning them like a top. If they are hard-boiled they will spin on one of the ends. The fluid contents of fresh eggs, however, will slosh around and prevent top action. O. K.! this is not very euri- ous, so we'll place a hard-boiled egg in a fíat pan containing a thin layer of water and give it a spin. Not only does the egg spin on end but a layer of water creeps up the side of the egg. When the water is about half way up the side of the egg it breaks up into droplets and sprays out horizontaUy like a rotating lawn sprinkler.

No mysterious forces are involved, ñor are there spooky quantum mechanics effects. The major forces operating are gravity, centrifugal forcé, and adhesión between the egg surface and the water. As the film of water creeps up the egg, the centrifugal forcé increases and over- comes the forcé of adhesión. Then, water droplets spray outward.

(Gutiérrez, Gustavo, et al; "Fluid Flow up the Wall of a Spinning Egg," American Journal of Physics, 66:442, 1998)



How a spinning, hard-boiled egg can create a water sprinkler.

Creating fluid corners in kitchen sinks. When a smooth column of water from your kitchen faucet hits the sink, it flows out radially. At a calculable radius, its height suddenly rises. This smooth, circular ridge is called a "hydraulie jump." Here, some of the kinetic energy of the falling water is converted into the potential energy of the deeper layer of water. Nothing particularly mysterious here.

But, if a liquid more viscous than water is used, the circular ridge is transformed into a neat polygon with surprisingly sharp corners. Diíferent flow rates create different polygons. Polygons with as many as 14 corners have been observed. Interestingly, identical flow rates can result in different stable polygons. See the referenced article for all the math.

(Ellegaard, Clive, et al; "Creating Corners in Kitchen Sinks," Nature, 392:767, 1998)

TWO WRONG-WAY PHENOMENA

Electrical currents flowing in opposite directions. How can this be? What about Ohm's Law? this counterintuitive situa- tion was confirmed in a recent issue of Science.

> Now two teams of researchers have induced millions of electrons to flow simultaneously both ways around a superconducting ring with a non-superconducting notch in it, a gizmo known as a superconducting quantum interference device, or SQUID.

This is all pretty weird but it just one more paradoxical phenomenon allowed by quantum mechanics. You see, in quantum mechanics, an object can exist in two or more States at the same time. This is, of course, a statement of fact rather than an explanation appealing to one's common sense---a common occur- rence in the quantum World.

(Cho, Adrián; "Physicists Unveil Schroe-dinger's SQUID," Science, 287:2395, 2000)

Heat flowing from coid to hot. The revered Second Law of Thermodynamics seems to tell us that heat always flows from hot to coid. But out in space, un- der special conditions, physicists seem to hedge a bit.

> The groundbreaking experiment was carried out onboard the Mir space station last year as part of the French-Russian Perseus mission. By warming a copper- and sapphire-walled cell filled with a drop of liquid sulfur hexafluoride and one tiny bubble of gaseous sulfur hexafluoride in near- zero gravity, scientists triggered a slight compression of the bubble.
> That gentle squeeze raised the temper- ature of the gas above that of the cell walls. For this to happen, heat must have been transferred from the cooler walls to the hotter gas, scientists report in the 1 May Physical Review Letters.

This weird phenomenon can be tossed off as a "transient temperature over- shoot." The Second Law didn't really apply because the system was not in thermodynamic equilibrium. Also, the Second Law really concerns changes in entropy rather than temperatures.

(Sincell, Mark; "Backward Heat Flow Bends the Law a Bit," Science, 288:789, 2000)

BRUISED APPLES

A serious problem has cropped up in supermarkets, where fresh, ripe apples are piled up high in beckoning pyra- mids. Surely, as the heights of the pyramids increase, the bottommost apples will be crushed, particularly those in the center under the apexes. Common sense teUs us that crushing forces will be greatest at Position #4 in the illustration.

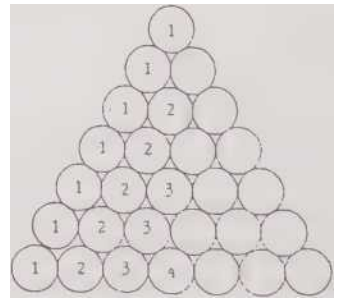
But grocers need not be concerned about Apple #4. Two Czech researchers, J. Schmid and J. Novosad, using pres- sure sensors, found that in a horizontal plañe through a stacked pyramid the máximum pressure actuaUy occurs in a ring of objects (apples) some distance from the pyramid's vertical axis. How come?

(Watson, A.; "The Perplexing Puzzle Posed by a Pile of Apples," New Scientist, p. 19, December 14, 1991)

A theoretical analysis of the problem by J. Grindlay doesn't help much. He ana- lyzed a two-dimensional pile of disks, as shown, and calculated that máximum bruising forces should occur at the outermost disks instead of at the center,

(Grindlay, J.; "Bruised Apples," American Journal of Physics, 61:469, 1993.)

Comment. Thus, common-sense expecta-tions, experimental measurements, and theoretical calculations lead to three different results. Much more work needs to be done here.



MATHEMAT1CS			
96	11	89	68
88	69	91	16
61	86	18	99
19	98	66	81

MATHEMATICS

4 9 8

11 7 3

6 5 1 0

49, April 29, 2000)

MAGIC SQUARES

QUADRAMAGICOLOGY

8 1 6

3 5 7

4 9 2

"Quadramagicology" has heen proposed for the study of magic squares. Science Frontiers has certainly not neglected these arraye of numbers so absolutely vital to the human understanding of the universe, as the several foregoing ítems demónstrate. And, doubtless, this wiU not be the last time we delve into this subject.

Maybe we're a bit frivolous this time, but who can resist a magic square that retains its magical properties when turned upside-down?

(Mackenzie, Dana; "Quadramagicology," New Scientist, p. 51, December 20/27, 2003)

A MAGIC SQUARE WXTH A MAGIC PRODUCT

In the next column, we reproduce a magic square that is "more magical than others" and ask if some magic squares could be classified as "perfect." Ap- parently, the answer is YES.

It turns out that the familiar 3x3 magic square shown below possesses another marvelous property in addition to its magiekness: it has a "magic pro- duct." If you add the produets of the numbers in each row, you get 225; that is, (8x1x6 + 3x5x7 + 4x9x2 = 225). Do ■ the same with the columna and you also get 225. This is the "magic product." But, wonder of wonders, 225 is also the square of this particular square's char- acteristic number, 15. Ain't that neat?

(Denham, Susan; "Magic Product," New Scientist, p.

PRIME SQUARES

64	92	81	94	48	77	6	63	50	61	83	7	130	12	119
31	99	14	97	47	114	2	128	45	101	15	115	49	113	18
24	132	41	134	8	117	2	103	10	138	121	6	109	85	126
23	107	6	105	39	122	2	136	37	109	86	6	86	96	5
16	140	33	142	7	9	1	111	2	49	55	6	40	96	2
75	55	58	53	91	70	7	84	89	9	188	2	38	104	6
76	80	93	82	60	65	7	51	62	1	149	3	90	52	7
115	15	98	13	23	30	12	44	129	46	96	2			
116	40	133	42	10	25	119	11	102						
123	107	5	13	22	36	13	104	6						
124	32	141	34	10	17	127	3	110						
71	59	54	57	87	74	6	89	85						
						8		3						

"T ~T2i

The above is obviously not a magic square. Its distinction is that the three-digit numbers in both columns and rows are all primes. Even more amazing, the rows are also primes when read backwards, making this particular square an ambi- dextrous prime square. Since the middle column, when read upwards, is an even number and therefore not a prime, this square is not omnidextrous. There are, however, omnidextrous prime squares. Higher-order prime squares also exist.

(Shasha, Dennis E.; "Prime Squares," Scientiflc American, 288:89, June 2003)

Comment■ OK! So, prime squares are not anomalous and shouldn't be taking up space in Science Frontiers, But, Bince we think they are "Interesting," they stay!

SOME MAGIC SQUARES ARE MORE MAGICAL THAN OTHERS

It is rather suprising that magic squares exist at all. Why should we be able to arrange 0 and the first 143 integers into a 12 x 12 square such that all columns, rows, and diagonals add up to 858? Believe it or not, there are actually more than two billion 12 x 12 magic squares! However, the particular 12 x 12 square reproduced here is more magical than most.

First off, it is "pandiagonal." This means that broken diagonals, such as those like 61-12-118 + 85-3-120-25-13182-58-140-23 also add up to 858.

Second, this square is classified as "most-perfect" because the numbers in each and every 2x2 square add up to 286. How could a magic square be more perfect than this?

(Stewart, Ian; "Most-Perfect Magic Squares," Scientific American, 281:122, November 1999.)

Comment. We ask, with tongue-in-cheek:

"Aren't we lucky to have such an interesting number system?"

ALPHAMAGIC SQUARES

Not everything in Science Frontiers is profound or anomalous, although we hope most of the ítems are at least somewhat interesting.

Magic squares, we think, are endless- ly fascinating. They exiBt in forms that verge on the unbelievable. You can even construct large magic squares from smaller magic squares. Nevertheless, the fact that alphamagic squares exist in large numbers is unexpected.

Alphamagic squares come in pairs. The first member of the pair consists of a magic square in which the numbers are spelled out letterwise, as in this example:

five	twenty-two	eighteen
twenty-eight	fifteen	two
twelve	eight	twenty-five

The numbers add up to 45 in all rows, columns, and diagonals. The square is "magic" in words.

The second member of the pair is formed by counting the number of letters in each word of the first square, thus:

This square is also magic, adding up to 21 in all directions!

Just a fluke, you say? Not so. You can even construct alphamagic squares in different languages. In his column in Scientiflc American, I. Stewart provides examples in Freneh, Germán, Welsh, and even Swahili! In Germán, there are no less than 221 alphamagic squares using numbers under 100.

(Stewart, Ian; "Alphamagic Squares," Scientific American, 276:106, January 1997)

Comment. The "deep meaning" of alpha- magic squares is about the same as that associated with the existence of your Social Security Number in the decimal expansión of pi!

17 47 30» 36 21 43* 26 40

32 34 19 45* 28* 38 23 41

33 31 46 20* 37* 27 42 24

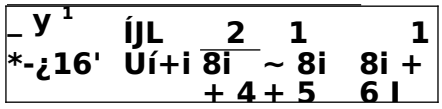
48 18 35* 29 44 22* 39 25

49 15 62* 4 53 11* 58 8

64 2 51 13* 60* 6 55 9

1 63 14 52* 5* 59 10 56

16 50 3» 61 12 54* 7 57



All rows and columna add up to 260, although the two diagonals do not. This deficiency would seem to greatly dimmish the square's magickness. But get out your calculator and add up the numbers in those two blunt chevrons marked by • and *. They add up to 260, so does an (un-marked) S-shaped eolumn beginning with 36, and its mirror image beginning with 21 also yields 260. But wait, there's more, as the TV adds [!] shout, the four "bent" columns can each be slid to right or left, maintaining their shapes, and still add up to 260!

(Holden, Constance; "Number Fun with Ben," Science, 292:843, 2001)

viously more irregular than 01010101. Pincus et al tested for irregularity by counting the frequency of groups of digits. In binary, for example, there are four possible pairs: 00, 01, 10, and 11. A truly random sequence of digits should have equal numbers of each pair. The sequence 01010101 fails this test badly, for 00 and 11 are completely lacking. Pincus et al tested pi, e, 2*, and 3* for irregularity by counting trip- lets of digits in the first 280,000 digits of each number being tested.

Intuitively, most mathematicians would expect that the two transcendental (nonalgebraic) numbers, pi and e, would be more irregular than the algebraic numbers, 2® and 3*. Pi did turn out to be the most irregular, but surprisingly 2» beat out e. 3* was fourth.

Also curious, at least to mathematicians, is the discovery that differences in the irregularities of the four numbers tested are substantially less when the same numbers are expressed in decimal rather than binary form.

(Seife, Charles; "New Test Sizes Up Randomness," Science, 276:532, 1997. Also: Anonymous; "Assessing Irrational Irregularity," Science News, 151:340, 1997)

PI

HOW TO FIND A PIECE OF PI

The formula shown below allows one— if one wishes—to find the billionth digit of pi without first computing the preceding 999,999,999 digits. In other words, isolated digits of pi can be quickly calculated should an urgent need arise. P.B. Borwein et al, at Simón Fraser University, announced this "curi- ous" discovery in October 1995.

Innuendo aside, there is something more than "curious" here. It seems that the formula Works only for hexadecimal (base-16) digits of pi. These can be easily converted into binary (base-2) digits. Strangely, it does not work at all for our familiar decimal (base-10) digits of pi.

Not to worry though! Y. Ranada and colleagues, at the University of Tokyo, have now computed pi to 4,294,960,000 decimal digits. But, they have found a puzzling asymmetry. In the first 4 bil- lion digits, the decimal digit 6 occurs 400,033,035 times, but 2 shows up only 399,965,405 times! Shouldn't all ten digits appear with the same frequency? Obviously, we do not appreciate all of the subtleties of pi.

(Peterson, I.; "A New Formula for Pick- ing Off Pieces of Pi," Science News, 148:279, 1995)

QRDERING A PIECE OF PI

Are unplumbed regularities hidden in the first 1.2 billion digits of pi? None that mathematicians have discerned so far.
But who really cares? The fraction 22/7 is good enough for most applications. Who really needs the trillionth digit of this overly-revered transcendental number?
But this crude appeal to practieality will never deter the pi-aficionados.

In fact, they have discovered an amazing formula that allows one to produce any desired digit of pi----------even the trillionth or quadrillionth—without first computing the digits that precede it. The distant digits of pi are usually computed by laboriously adding the terms of an infinite series. It is downright eerie that one (really one's Computer) can skip over millions of calculations and pulí out any desired digit without knowing those that precede it.

(Gibbs, W. Wayt; "A Digital Slice of Pi," Scientific American, 288:23, May 2003)

Comment. This is like teleportation— getting to a far place without having to travel the road.

WBY PI?

S.M. Pincus, at the Swiss Federal Insti- tute of Technology, and colleagues have devised a way to assess the irregularity of irrational numbers, such as pi, e (the base of natural logarithms), 2^, etc.
This is not really a frivolous under- taking, because the digits of these irrational numbers are often used to genérate random numbers for such praetical applications as cryptography.

Irregularity in a string of digits is sometimes easy to spot. 0110100 is ob

LAZZARINI EATS HUMBLE PI (POSTHÜMOUSLY)

If you are on a desert island and have forgotten the vaiue of pi and need it desperately, you can find it experi- mentally. One amusing though tedious method would require throwing a short, straight twig onto parallel lines drawn in the beach sand. You will be able to compute pi from:

pi = 21N/dH,

where 1 = the length of the twig, wliich must be less than d, separation of the parallel lines. N = the number of throws. H = the number of times the twig crosses one of the lines.

One famous performance of this ex- periment was by M. Lazzarini in 1901. He reported that in 3408 throws he got 1808 intersections, leading to:

pi = 3.1415929

Actually, the final digit should be a 6. Thus, Lazzarini measured pi to a few parts in 10 million.

Recently, L. Badger, Weber State University, concluded that Lazzarini probably never actually performed his experiment. His resulte were just too good —too fortuitous! If the number of hits had been 1807 or 1809, pi would have been wrong by 1 part in 2,000.

As it turne out, a Chínese mathema- tician of the 5th Century pointed out that 355/113 = 3.1415929. It is very suspicious that Lazzarini's 3408 = 355 x 16, and 1808 = 113 x 16. Badger thinks that Lazzarini'B experiment was only a "thought" experiment based on the ratio 355/113.

(Maddox, John; "False Calculation ofTr by Experiment," Nature, 370:323, 1994)

1 089, 533, 432, 247, 059, 310, 875
780 378, 922, 957, 732, 908, 036, 492
993 138, 195, 385, 213, 105, 561, 742
150 447, 308, 967, 213, 141, 717, 486

http://www.aros.net/~ angio/pistuff/ piquery

At this Web site you can enter your Social Security Number (or telephone number, etc.) and disco ver if it appears among the first 1.25 million digits of pi.

Perhaps wlien God was designing the Universe and was contemplating what the valué of pi should be, he put your number somewhere in this transcendental number!

(Anonymous; New Scientist, p. 64, January 4, 1997)

Comment. Of course, pi has as many digits as you care to compute (at least we think it does!) If your number is not among the first 1.25 million digits, it will certainly appear somewhere later. It's just that you are not first in line!

PRIMES

151

This 97-digit number is a prime, divisible by only 1 and itself. But, add 210 to it, and you get still another prime. Add another 210, and another prime pops up! You can do this six times and gets a series of seven consecutive primes in an arithmetic progression. Neat! And just a tiny bit of order in the distribution of primes. It took H. Dubner and H.L. Nelson about two weeks with seven computers running continuously to come up with this discovery. It seems relevant to mention that these gentlemen are semiretired and retired, respectively.

(Peterson, I.; "Progressing to a get of Consecutive Primes," Science News, 148: 167, 1995)

Comment. There are other traces of order in the distribution of primes. See vol. 1, p. 332.

SOMETHING STRANGE IS GOING ON!

Where? "Everywhere, of course," is the answer of any anomalist worth his or her salt. Especially, though, something strange in going on with prime numbers.

In an homage to the revered mathematician P. Erdos, who died September 20, 1996, D. Mackenzie mentioned a theory Erdos published in 1940 with M. Kac. This theory States that a plot of the number of prime factors of very
large numbers forms a bell curve-----
almost as if these numbers were "choosing" their prime factors at random. Alluding to a assertion Einstein is said to have made, Erdos commented:

> God may not play dice with the universe, but something strange is going on with the prime numbers.

(Mackenzie, Dana; "Homage to an Itinerant Master," Science, 275:759, 1997)

Cross reference. The distribution of prime numbers is more than strange, see the plot in vol. 1, p. 332.

What do prime numbers have to do with the real world? Are math and natural Science really sepárate, unlinked disciplines?

Pythagoras, 2,500 years ago, decided that: "All is number." He may be right. A strange conneetion seems to exist between prime numbers and quantum physics. On one side of the chasm that supposedly separates math from physics, we have the prime numbers and the Riemann zeta function, which provides information on how prime numbers are distributed among the other integers. On the "physics" side of the chasm, we have the behavior of complex atomic systems. The chasm seems bridged when one compares the energy levels of an excited heavy nucleus with the distribution of the zeros of the zeta function.

PHI

DID MOZART ÜSE THE GOLDEN SECTION?

Does the brilliance of Mozart's eomposi- tions derive entirely from his musical genius, or did he rely in part upon a mathematical construct: the famous Gol- den Section or Golden Ratio? The Golden Seetion is a mathematical formula for dividing into two parts: a geometrieal line, a musical composition, or anything else possessing the property of length. The ratio of the two divided parts is the Golden Section, whicb equals 0.618.* * For some artists, musicians, arehitects, the Golden Section is the most esthetic way of dividing the length of anything.

For humans, the history of the Gol- den Section goes back at least as far as Euclid in 300 BC. For nature, it began eons ago: The shapes of pine cones, starfish geometry, and other dimensions of living things incorpórate the Golden Section. The questions we address here are:

(1) Did Mozart consciously make use of this ratio, 0.618, in his musió?

(2) Why is the Golden Section esthetically pleasing?

It is not well known that Mozart was fascinated by mathematics as well as music. He even jotted down equations in the margins of some of his compositions. Chances are exeellent that he knew of the Golden Section and its reputation
for conferring elegance on structures--------
even musical compositions.

J.F. Putz, a mathematician, has measured some of Mozart's Works. Mozart's piano sonatas were convenient targets, because in Mozart's time they were customarily divided into two parts:

(1) Exposition; and

(2) Development and Recapitulation.

Sure enough, the first movement of Mozart's Sonata No. 1 in C Major consista of 100 measures that are divided into the customary two parts; 38 are in the first, 62 in the second. This ratio 38/62 (0.613) is as cióse as one can get to 0.618 in a composition of 100 measures. The second movement of this sonata is also divided according to the Golden Section, but the third movement is not. Many other Mozart piano sonatas seem to employ the Golden section, but some deviate considerably. So Putz could not really claim that Mozart consciously used the Golden Section to "improve" his music (Question #1 above), but there are certainly a lot of "coinci- dences."

(May, Mike; "Did Mozart Use the Golden Section?" American Scientist, 84:118, 1996)

Question #2 above. Why is a particular ratio exceptionally pleasing to humans ----and to nature in general? The ratio 0.5 seems neater! If Mozart used the Golden Section unconsciously and fre- quent-ly, the Golden Section may some- how be encoded in the human brain as it is in the biological machinery that Controls the developing pine cone and starfish. In humans the Golden Section mainfests itself in artistic creations rather than boldily morphology! Obvious- ly, we cannot answer Question #2.

*To calcúlate the Golden Section, the length of a line (or muscial composition) is made equal to 1, and then divided into a short section, x, and a longer section, (1 -x). The ratio of the short section to the long section is then made equal to the ratio of the long section and the length of the whole line:

$$x/(l - x) = (1 - x)/1$$

This can be solved for x, and the Gol- den Section:

$$x/(l - x) = 0.618$$

Why should this correspondence exist? B. Cipra exclaimed:

> Just why number theory and quantum chaos should be soul mates is a mystery for the gods to unveil.

(Cipra, Barry; "Prime Formula Weds Number Theory and Quantum Physics," Science, 274:2104, 1996)

Comment. God, well known to be a geometer, evidently also dabbled in prime numbers!

COMPUTERS

AN INNOVATIVE COMPUTER

On p. 288, we chronicled the chess match between IBM's Big Blue Computer and . human Champion G.K. Kasparov. Incidental to the match itself was the fact that Big Blue sometimes made different moves when confronted with identical chess- boards! With these denials o£ cyber- determinism in mind, consider the follow- ing anecdote.

About 40 years ago, D. Herschbach witnessed the first test of an early chess-playing program written by the renowned S. Ulam for the MANIAC I Computer.

> In this test, the MANIAC I Computer played both sides of the board. After a rather bizarre game, Black made a move that checkmated White. Only then did Ulam realize that the program did not say what to do when mated; it just required that a move be made to escape check. While Ulam and his colleagues debated what might happen, the Computer whirred on for about ten minutes. Finally it punched out White's move (on paper tape, then the mode). The uncanny solution: a spurious pawn appeared and began to march down the board to become a new queen.

(Herschbach, Dudley; "Computer Milestones," Disco ver, 17:12, October 1996)

Comment. If vacuum-tube-equipped MANIAC I was so resourceful and in- novative, what might a modern super- computer "think" up? Remember HAL of 2001: A Space Odyssey and treat your own Computer with respect!

INDETERMINACY IN COMPUTERS

On p. 288, it was remarked that a chess-playing Computer will sometimes make different moves when faced with identical boards. R.G. Everit responds that this is not really mysterious. The better chess-playing computers are actually designed to behave unpredictably when confronted by several moves of roughly equal promise. This feature makes it more interesting for human players.

Everit also sets us straight in the matter of Computer determinacy.

> However, contrary to your basic assumption, most computers (even a home PC) can be forced to behave truly unpredictably. This cannot be done using the random-number gene- rators supplied with the software., as these depend upon some mathematical formula and so are determined in advance, even if they appear to show no pattern. But if the machine has an internal dock readable by the programmer, he can determine the machine's choice depending upon the time required for some complex calculation, which will vary according to such factors as minute volt age variations and the aging of the machine's componente. For example, the CDC 3600, on which I learned to program in 1975, had an accessible microsecond dock, and my program to calcúlate the fírst five perfect numbers* required about 15 minutes of run time; the last few digits of the exact number of microseconds required to run this program each time varied quite unpredictably. In other words, it was a random number, except perhaps from the standpoint of philosophical determinism, which claims that every event in the entire universe has been determined from the beginning.

(Everit, Richard G.; personal communication, November 2, 1996)

*A perfect number is equal to the sum of its'divisor s. The first two are 6 and 28; the others being difficult to find with just pencil and paper!

Comment. Computer unpredictability? There's something human in those chips! Of course, K. Capek knew this wauld be the case with any complex machine, as he predicted in his 1921 drama R.U.R, (Rossum's Universal Robots).

CAN COMPUTERS HA VE NDEs?

When HAL, the treacherous Computer in the film 20Q1: A Space Odyssey, was being slowly throttled by the oné sur- vi ving astronaut, it tried first to nego- tiate. Then, as board after board of electronic componente were disconnected, it burst into the oíd song A Bicycle Built for Two. It had learned this tune early in its silicon-based life. Surpri- singly, real computers can experience similar Near-Death Experiences (NDEs).

S.L. Thaler, a physicist at McDonneU Douglas, was studying neural networks designed to mimic the structure and functions of the human brain. Such neural nets can actually learn as pro- grammers train them. As a evening avo- cation, Thaler devised a program that randomly severed connections in the neural net, in effect destroying the artificial brain bit by bit. When between 10 and 60% of the connections were destroyed, the nét spat out only gibberish. Near 90% destruction, though, strange "whimsical" information was produced that was definitely not gibberish. In contrast, untrained neural networks generated only random numbers as they were "put down"!

Evidently, HAL's tuneful demise was not so fanciful after aU.

(Yam, Philip; "Daisy, Daisy," Scientific American, 268:32, May 1993)

Comment. A.C. Clarke, author of 2001, has stated firmly that HAL's ñame was not chosen because its letters were one step away from IBM! "Puré coincidence," he has declared. Even though the odds against it are 26^3 to 1.

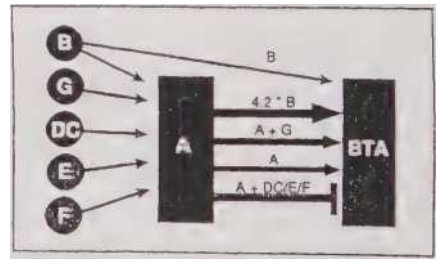
(Anonymous; Fortean Times, p. 9, no. 98, June 1997)

THE EVOLUTION OF COMPUTESS

So, you thought this Ítem was going to be about advances in chips, módems, and related hardware? It's not about software either. It's about bioware.

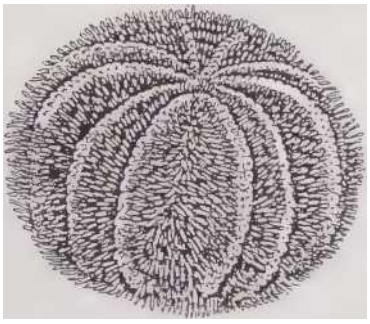
The title of a recent article in Science began with: "Genomic Cis-Regulatory Logic." That's obscure enough to make you move on to the next article, parti- cularly when you see that sea urchins are involved. But Duried in all the tech- nical jargon is a profound discovery: The genes of all living things, from sea urchins to humans, are in reality Systems consisting of thousands of simple computational devices.

Very, very briefly, the regulatory regions for animal genes, are termed "promoters." Promoters typically con- sist of a few hundred to several thou- sand bases of UNA. In the work of Yuh et al, the article's authors, these promoters are seen to perform as logic circuits, just like those bits of Silicon in your PC. These tiny, DNA-based biologi- cal logic circuits determine how genes are interpreted (each gene may be inter- preted in several ways), and, in the end, how lifeforms develop from embryo to adult.



The complexíty of bíological computers is seen in the logic Circuit of a pro- moter for the gene Endo 16. (From: Science, 279:1871, 1998)

(Yuh, Chiou-Hwa, et al; "Genomic Cis-Regulatory Logic: Experimental and Computational Analysis of a Sea Urchin Gene," Science, 279:1896, 1998. Aleo: Wray, Gregory A.; "Promoter Logic," Science, 279:1871, 1998)



A computer-carrying sea urchin. Sharp in more ways than one.

Comment ■ Figuring out how your PC's hardware evolved is child's play compared to elucidating just how random mutation and natural selection evolved the thousands of different logie circuits switching on and off in your body as you read this. It's all due to entropy!

EVOLVABLE HARDWARE

First, you must envision a Computer chip as an evolvable entity------an array of logie gates that can be connected in an almost infinite number of ways. A software instruction becomes the equivalent of a biological gene. Software instruc- tions can be changed to achieve certain hardware goals just as genes can be rearranged to modify an organism. Fur- thermore, human operators can specify a hardware goal to the chip and let it evolve on its own, something it can do in microseconds rather than millions of years.

This is not a frivilous subject. D. Fogel, chief scientist at Natural Selection, Inc., in La Jolla, California, asserts:

> Eventually, we will need to know how to design hardware when we have no idea how to do it.

A few demonstration devices have already been built, and in them we see something worthy of note for Science Frontiers. One such device, built by A. Thompson, University of Sussex, was tasked to identify specific audio notes by certain voltage signáis. Given 100 logie gates, the device needed only 32 to achieve the result. The surprise was that some of these working gates were not even connected to others by normal wiring. Thompson admitíed that he had no idea how the device worked. Something completely unexpected had evolved. Perhaps, thought Thompson, some of the circuits are coupled electromagnetically rather than by wires. Human engineers would never have tried this stratagem; it is not even in their Computer-design repertoire.

(Taubes, Gary; "Computer Design Meets Darwin," Science, 277:1931, 1997)

Comments. Evolvable hardware, like God and Nature, works in mysterious ways! As the above type of hardware evolves, it will probably leave a "fossil record" full of mysterious transitions!

What shall we cali the units a cyber-heredity? "Cyberenes" is too cumbersome. How about: "bytenes"?

EVOLDTION OF CYBERLIFE

The evolvable hardware described above is only one several efforts under- way aimed at modeling life and evolution.

Network Tierra. Here we have a network of 150 computers linked worldwide by the Internet. One objective is the ex- ploration of structures and patterns of information that drive evolutionary pro- cesses. A key element is an artificial lifeform that begins as a "seed organism" (modeled as information, of course) that wanders at will among the different en- vironments presented by the computers in the network. So far, these digital organisms are surviving and changing.

(Blakeslee, Sandra; "Cyberlife Critters Evolving in Computer Network," Austin Ameriean-Statesman, November 30, 1997. Cr. D. Phelps.)

Minad Project. Begun in 1953, the Minad Project is puré futurism; that is, the prediction of where the Computer revolution is taking us. The Minad Project envisioned three evolutionary stages:

(1) Wiring the world (already accomplished as today's Internet);

(2) The transformation of the network into a high-speed Creative mechanism (the Technosphere); and

(3) The emergence of global hyper-intelligence (the Autosphere).

The Minad Project is now forecasting what this all means for non-silicon-based life in the 21st. Century.

(Baker, Lance; "They're Taking Over," New Scientist, p.55, December 6, 1997)

http: /*1* w w w. Shakespeare. unduplicated

We can forgive computers for a few errant hyphens but not for their failure to live up to their literary potential. R. Wilensky has complained:

> We've all heard that a million monkeys banging on a million typewriters will eventually reproduce the entire works of Shakespeare. Now, thanks to the Internet, we know this is not true.

(Anonymous; "Feedback," p. 92, New Scientist, May 10, 1997)

nnnbbbbbvccccccxzzzzzcvbn, *',1111* /ppooo

If you found the above message on your home-PC screen after returning with a cup of coffee, you have a cybercata- strophe on your hands. A feline friend has just ambled across your keyboard.
In a worst-case scenario, cat curiosity may have caused your Computer to crash. It is urgent and imperative that you install a program caUed "PawSense" that can detect pawprints and block further inputs. PawSense will also post the message: "Cat-Like Typing Detected." It will in addition generate sounds known to be very annoying to cats. You can regain control of events by typing the word "human."

Sure, this is all pretty funny, but just how does a Computer distinguish be- tween paw-generated input and the gib- berish present in e-mail addresses and the like? The rationale behind PawSense recognizes that cat paws are so broad that they actúate groups of adjacent keys simultaneously.

(Mirsky, Steve; "C-A-T-T-T-T-T-T-T," Scientiflc American, 282:26, March 2000)

Comment. Please note that we have re-frained- - -with some difficulty—from introducing "eat-and-mouse" humor!

ACH DD LIEBER HIMMEL

I. Docherty decided to try out a Computer translation service. He took the flrst four lines of a well known poem by Wordsworth and had it translated into Germán by the service. Next, he had the Germán translated back into English. Sorry about this, Wordsworth.

Input

I wandered lonely as a cloud
That floats on high o'er vales and hills
When all at once I saw a cloud,
A host of golden daffodils;...

Output

I was surprised lonely as a cloud Swims on high o'er vales and hill,
When in a course I saw a mass,
A central processor of the golden daffodils;...

(Anonymous; "Feedback," New Scientist, p. 96, January 31, 1998.)

Comment. Perhaps computers have a sense of humor after all!

THEY WENT A BYTE TOO FAR!

> A Germán couple in a luxury car with a computerized satellite-steered navigation system drove into the Havel River near Potsdam Friday night because the computerized satellite-steered navigation system neglected to mention they needed to stop for a ferry at this point.

(Anonymous; "Next Time, Ask for Directions," Chicago Sun-Times, December 28, 1998. Cr. J. Cieciel.)

COMPUTER CON FUSION

Not contení with joking about "nomina- tive determinism" (p. 322) , the "Feedback" page of New Scientist has been having fun with "rogue hyphens." These errant hyphens occasionaUy appear in the very best of our newspapers and magazines. Word processors inserí them in the wrong places when trying to jus- tify linea of text. Sorae are hilarious, as are these gleaned from Canadian newspapers by B. Taylor:

mans-laughter deter-gents calfs-kin thin-king cart-ridges end-anger trarap-led casual-ties prick-led

(Anonymous; "Feedback," New Scientist, p. 80, February 18, 1997)

Comraent. Certainly there can be nothing anomalous about rogue hyphens, Wrong! After G. Kasparov was defeated recently by IBM's Big Blue Computer, all the commentators told us not to worry about being replaced because computerB were just machines. For example, they had no sense of humor. From the cleverly inserted hyphens above, we now know this is not true!

WHERE DO ALL GOOD DELETED DATA GO?

It takes just a touch of a button to consign once-valued words and figures to virtual oblivion. If you think this is cruel and heartless, a Buddhist monk in Japan has established a virtual Information Temple. S. Ishiko, the chief priest, will take applieations to have memorial Services performed for not only deleted data (whether intentional or not) but also "lost" data. He also offers spiritual counseling at his Internet site:

http: / / www. thezen .or.jp

(Anonymous; "Feedback," New Scientist, p. 104, June 7, 1997)

MATH MISCELLANY

HOW TO WIN BY LOSING (TWICE)

It's all exceedingly counterintuitive. If you switch randoraly between two games of chance, each of which is guaranteed to empty your pockets if played separa- tely, you can actually win. This pheno- menon can be proved mathematically, but we will not inflict this upon our readers, even if we understood it.

Two games played with coins illu- strate the effect. One game employs a weighted eoin such that the probability of winning is much less than 50%. If played alone, your capital decreases steadily in a rather smooth curve, with a small win now and then but many small losses. The second game requires two weighted coins and is also a losing proposition by itself. Here, though, the graph of your assets vs. the number of games played is a sawtooth. There are sharp increases and downturns, but with an average downward trend.

Switching between the two games in a random manner has the effect of locking in a win before the next loss comes along. It's a ratchet effect. Your overall capital will rise, at least it does aecording to the equations, though your intuition cannot help but doubt it. No wonder this is called Parrondo's Paradox!

(Harmer, Gregory P., and Abbott, Derek; "Losing Strategies Can Win by Parrondo's Paradox," Nature, 402:864, 1999. Anonymous; "Losing to Win," Science News, 157:47, 2000)

THE FIRST DIGIT PHENOMENON

Baek in 1881, Simón Newcomb, the re-nowned Canadian-Araerican scientist, pub-lished a provocative conjecture that was promptly forgotten by everyone. Newcomb had noticed that books of logarithms in the librarles were always much dirtier at the beginning. Hmmm! Were his fellow scientists looking up the logarithms of numbers beginning with 1 more frequent- ly than 2, 3, etc.? It certainly seemed like it. He formalized his suspicions in a conjecture:

P = loglüU + 1/d)

where p = the probability that the first significant digit is d.

This (unproven) equation states that about 30% of the numbers in a table or group will begin with 1. Only about 4.6% will begin with 9. This result certainly clashes with our expectation that the nine digits should oceur with equal probability.

Fifty-seven years later, F. Benford, a GE physicist, unaware of Newcomb's paper, observed the same dirty early pages in the logarithm tables. He carne up with exactly the same conjecture. Benford didn't stop there. He spent several years collecting diverse data sets—20,229 sets, to be exact. He included baseball statistlcs, atomic weights, river areas, the numbers ap- pearing in Reader's Digest articles, etc. He concluded that his (and Newcomb's) conjecture fit his data very well. There were notable exceptions, though. Tele- phone directories and square-root tables didn't support the conjecture.

Interestingly, the second digits in numbers are more equitably distributed; the third, even more so.

Mathematicians have never been able to prove the Newcomb-Benford conjecture. How could they if it doesn't apply to all tables? Nevertheless, it works for most data sets, and that's still hard enough to explain.

(Hill, T.P.; "The First Digit Phenome- non," American Scientist, 86:358, 1998)

PUZZLING PARTITIONS

The Indian mathematician S. Ramanujan has been caUed a "magical genius" be-cause hi6 remarkable insights seemed to come out of the blue-----like magic. We have not neglected Ramanujan in this newsletter (vol. 1, pp. 308, 332), and now we spotlight him again.

First, a quick primer on a fascinating mathematical byway called "partitions". A partition is a way in which a whole number can be expressed as the sum of positive integers. For example, 5 can be partitioned in seven ways:

5
4 + 1
3 + 2
3 + 1 + 1
2 + 2 + 1
2 + 1 + 1 + 1
l + l + l + l + l

The number 4 has only five partitions. Check it out.

Historically, ordinary mortals saw no patterns in the number of partitions possessed by the parade of numbers until Ramanujan carne, along. He had in front of him a list of the number of partitions for each of the first 200 integers. They ranged from one (for 1) to 3,972,999,029,388 (for 200). [That this list was prepared without the help of a Computer is itself worthy of men- tion!]

Here is the order that Ramanujan perceived:

> Starting with 5, the number of partitions for every seventh integer is a múltiple of 7, and starting with 6, the number of partitions lor every llth integer is a múltiple of 11. More- over, similar relationships occur where the interval between the chosen integers is a power of 5, 7, or 11 or a product of these powers.

Ramanujan was able to prove that these curious patterns also hold for all higher numbers beyond 200.

Ramanujan's discovery carne as quite a surprise to the world of mathematics, as did the strange roles of the three adjacent prime numbers 5, 7, and 11.

Recently, though, K. Ono has gone beyond Ramanujan and proved that there are really an infinite number of relationships like the three found by Ramanujan.

(Peterson, Ivars; "The Power of Partitions," Science News, 157:396, 2000)

Comment. Surely all this number fiddling has no practical valué. You never know, though, when someone with great insight will see some natural phenomenon mathematically mirrored by partitions. How about fractals, for example, or the seemingly useless Fibonacci scquence of numbers? .

ESOTERICA

HUMAN NATURE AND DESTINY

BIEN LIKE GODS

With the theft of the title from one of H.G, Wells' novéis, we attend to an article that appeared in the London Times last summer. The article was based upon a paper written £or the Quarterly Journal of the Royal Astro- nomical Society by Prof. E. Harrison.
If, said Harrison, some properties of the universe had been just a tad differ- ent, our universe would be barren of stars, light, and of course life itself.
He mentions such properties as the strength of gravity, the charge on the electrón, and the speed of light. Why, he and many others have mused, are these critical properties so precisely adjusted so as to permit the existence
of life----and us? Harrison lists three answers:

•This is the way God vyanted it to be. Further inquiry is unnecessary.

•If the universe were constructed any other way, we wouldn't be here to ask such silly, anthropomorphic ques- tions! Some find this "anthropic principie" to be no answer at all.

•Our universe was actualiy created and its properties fíne-tuned by non- supernatural entities of superior intelli- gence living in another universe. [These beings apparently get a kiek out of manu- facturing other universes, or perhaps it's a religious imperative for them!]

Before you crumple up this issue of SF and hurí it at very high energy into a wastebasket, consider these two para- graphs from the Times article.

> "We are beginning to see how universes can be created," Professor Harrison says. "A small amount of matter---roughly 10 kg------at very high energy is forged into a black hole. Under the correct conditions, the interior of the black hole inflates into a new universe that endures for billions of years and contains billions of galaxies."
>
> At most, he argües, human intel- ligence is only one million years oíd. "If we can already see how in principie universes can be created, then surely our descendants in the far future will have the knowledge and technology to design and create them."

(Hawkes, Nigel; "Aliens May Have Created Universe, Says US Scientist," London Times, August 21, 1995. Cr. B. Greenwood via L. Farish.)

Comment. So, if we evolve further, as we must be doing, we can create new universes ourselves and truly be like gods! And we look down on the alchem- ists of yore.

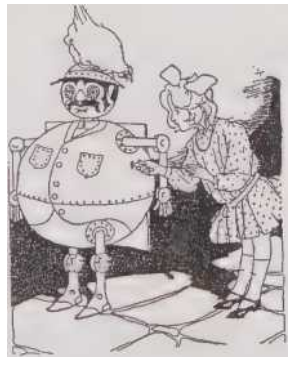
ARE WE REALLY ROBOTS?

We imagine ourselves to be different from inorganic nature—flesh and blood — certainly not hardware. But the real truth may lie beyond our ken.

But can we really prove that we are not machines? G. Johnson has a few words to say on this s.ubjeet in his book Fire in the Mind: Science, Faith, and the Search for Order.

> Thinking in terms of bits has allowed us to develop the fíeld of Computer Science, in which we learn how to represent the World with patterns of information. So successful are our endeavors that some physicists and Computer scientists believe that perhaps information is not a human in- vention but something as real, as physical, as matter and energy. And now a handful of researchers have come to believe that information may be the most real of all. Simulated creatures would have no way of know- ing they are simulations, the argu- ment goes. And, for that matter, how do we know that we are not simulations ourselves, running on a Computer in some other universe?
>
> Nature, it seems, has honed us into informavores so voracious that some can persuade themselves that there is nothing but information.

(As quoted in: Science, 273:443, 1996)



Tik-tok was the most famoua thinking machine in the Land. of Oz. Tik-tok is obviously a robot, but perhaps there are two other robots in the sketch!

Comment. If we really are simulations, that "Computer in some other universe" has taken great pains to also simúlate millions of other species and their fos- sil records! (Could a cybergod do all this?) Fun to think about any way. Come ■ to think of it, Omar may have had it right when he wrote:

> We are no other than a moving row of magic shadow-shapes that come and go.

Well, maybe that's too far-fetched; but what about all those UFOs and their occupants; they are a bit shadowy?! They might be cyberbeings.

"ALREADY, NOW, WE ARE FORGOTTEN ON THOSE STELLAR SHORES"*

Humans have many ways to predict the future: animal entrails, Tarot cards, and the Copernican Principie. The Co- pernican Principie, in particular, Teads to all sorts of profound prophecies.

The Copernican Primciple states that the earth does not occupy a special place in the cosmos. To this we add Darwinism, which asserts that, in the realm of biology, human origin is not special either; i.e., we enjoy no special place among life forms. Building upon these two general "beliefs," J.R. Gott, III, proceeds to estímate the longevities of various observables, such as the life- time of a particular species. What fol- lows is a long, highly technical comput- ation of various probabilities, such as the evolution of intelligent life in the universe. All this (and there is a lot of it) leads to the following:

> Making only the assumption that you are a random intelligent observer, limite for the total longevity of our species of 0.2 million to 8 million years can be derived at the 95% con- fidence level. Further consideration indicates that we are unlikely to colonize the Galaxy, and that we are likely to have a higher population than the median for intelligent species.

Why won't we colonize the Galaxy? Not because we are not able to, Gott says, but because "living things do not usually live up to their máximum poten- tial."

Also of interest here is Gott's assess- ment of SETI (our Search for Extrater- restrial Intelligence). Will our big radio telescopes pick up intelligent murmurings arriving from outer space? Gott's calcu- lations are very pessimistic here:

> Thus, we do not expect to see a Dyson sphere civilization within our Galaxy, or a Karadashev type III civilization within the current observable horizon.

(Gott, J. Richard, III; "Implications of the Copernican Principie for Our Future Prospecta." Nature, 363:315, 1993)

*A line from Stephen Spender's poem From All These Events, from the Slump, from the War, from the Boom.

Comment. But perhaps the Copernican Principie, Darwinism, or some other of Gott's assumptions are in error.

ALIEN CONTACTS

THE GREAT EXODÜS

Those who believe that the universe is populated by many technically advanced civilizations have long wondered why we earthlings have not been offíeially in- vlted to join the Intergalactic Federa- tion. Where are those extraterrestrial emissaries anyway?

Unfortunately, the extraterrestrial traffic seems to be going at warp speed in the wrong direction. Instead of inter- stellar spaceships converging on earth full of helpful aliena, everyone (or everything) seems to be fleeing our environs. The proof positive is in all those quasars with high redshifts. In reality, they are not energetic astro- nomical objects but rather spaceships emitting great power fluxes in our direction from their engines. Earth- bound astronomers are really viewing the aft ends of rapidly receding space- craft. No one ever sees any blue-shifted. - quasars that would tell us that visitors are coming to see us!

We are thus truly alone in space, perhaps "deserted" is a better word.
What did we do wrong?

(Duncan, Dave; "What Do They Know?" New Scientist, p. 52. May 13, 1995)

WHERE ARE THOSE ALIENS?

In 1950, E. Fermi raised the big question: If aliens exist, why aren't they here?
Of eourse a multitude of answers were put forward. Nine of the usual kinds were listed at the end of a long series of articles in N ature on astrobiology.
For example, ufologists say the aliens are here already. Others say we are too primitive for the aliens to bother with us. And so on. But the last paragraph of the last article comes up with a different
sort of answer to Fermi's question-----a rather plaintive one.

The author notes that we landed on the moon way back in 1972, but do not now have that capability. We have ean- ceUed the unmanned probe to Pluto. And no one shows much enthusiasm for the manned space station. The heart of the matter is that we ourselves have not ventured farther into space, we are losing the Star Trek spirit. This early loss of interest in space travel by our ■ society-in-general may be endemic in many species possessing enough intelli- gence to build starships. That's why we haven't seen any aliens. They've given up astronautics and would rather stay home and watch their equivalent of TV!

(Cohén, Jack, and Stewart, Ian; "Where Are the Dolphins?" Nature, 409:1119, 2002)

Comment. Ambitious space travel may require a more advanced type of human. Unbeknownst to us, evolution may be preparing us for a leap forward—a macromutation making us better space travelers. (Our present bodies fare very poorly in weightlessness.) Our current stasis in space technology is actually a preadaptative phase like those symmetrical feathers on the fossil non-avian dinosaurs described above. We have not yet reached the end of our evolution! Who knows what our genome is really plan- ning for us?

NOW WE KNOW WHY!

Circa 1950, physicist E. Fermi observed that our galaxy measures about 100,000 light years across, and that a space- faring race could cross it in only 100 million years, even if their starships poked along at only 1/1,000 the speed of light. Since our galaxy is about 10 billion years oíd, the very reasonable question is: If other intelligenees (ETs) exist in our galaxy, why haven't they found us by now? Actually, many ETs from many different cultures should be stopping by frequently.

J. Annis, an astrophysicist at Fermilab, believes he can explain the ap- parent dearth of ETs. The problem is gamma-ray bursts (GRBs). They are so powerful that they sterilize those galax- ies in which they oecur. Presently,
GRBs occur in each galaxy about once every 100 million years, but theory sug- gests that they were much more frequent in the past.

As a consequence, by the time intelligent life evolves anywhere and figures out how to build spaceships, they aire zapped by a GRB. Perhaps some do begin exploration of their galaxy, but they don't get very far.

(Matthews, Robert; "Sorry, Wé'll Be Late," New Scientist, p. 16, January 23, 1999)

Comment. Any reader of Science fiction can come up with other explanations:

(1) ETs have been here but find nothing of interest and le ave;

(2) ETs were here and helped build Atlantis, the Great Pyramid, the Face on Mars, etc.;

(3) ETs are here now but avoid human contact; and

(4) ETs are here now but look so much like us that we cannot tell the difference!

You are free to make up your own explanations !

Yes, we live in a favored galaxy, because life on earth has not been GRB-sterilized for at least 3 billion years— 30 times the average period between GRBs. Are we simply lucky?

THREE REASONS WHY ETs HAVE NOT CONTACTED DS

The letters to New Scientist advancing reasons why nobody-out-there seems interested in talking to us have been both amusing and thought-provoking. We'll mention just three.

First, Y. Dutil asks: What intelligent extraterrestrial entity would send out signáis which it knew would not be ans- wered in its lifetime?

Second, S. Walden suspects that an alien civilization would probably be afraid of announcing their presence to oppressive aliens, which are almost cer- tain to be out there somewhere.

Third, we quote R. Moore in full:

> Perhaps the lack of detectable ET Communications is because they have not been programmed in by the creators of our virtual world. Maybe this means that the simulation we live in isn't designed to go much beyond the point where we have the technology to observe ET. Does this mean we have reached the end of our useful lives and are about to get switched off?

(Various; "Go Away, ET," New Scientist, p. 27, August 31, 2002.)

Comment. Shades of The Matrix. We suppose that, to God, we and the cosmos do constitute a virtual world, at least to him or her or it!

MYSTERY SIGNALS BEAM FROM SPACE

A report from the annual meeting of the American Astronomical Society.

Over the past fourteen months, a radio telescope in Puerto Rico has analyzed over 30 billion signáis, as it kept its 1,000-foot metallic ear cocked for mes- sages wafting in from outer space. Of this large number, only 164 signáis cannot be explained either in terms of natural phenomena or human causes.
Since some of these 164 signal sources are fixed in the same locations in the sky, they just might mean that "some- thing" is trying to get our attention, or the attention of "something else" more intelligent than ourselves!

(Anonymous; "Mystery Signáis Beam from Space," Baltimore Sun, June 9, 1993)

SIGNALS FROM THE SUN AND, EVENTÜALLY (?), OTHER ENTITIES

It is rather amazing that we can de- tect neutrinos at all. Carrying no elec- tric charge and possibly massless, most zip right through the entire earth as if it were not there. A very, very few, however, are captured in huge, fluid- filled tanks built by physicists. These trapped ghostly partióles tell tales we do not yet fathom.

We have mentioned the solar-neutrino problem before (vol. 1, p. 84, for ex- ample). It is one of Bcience's more per- plexing and enduring mysteries. Even

the most modern, sophisticated neutrino deteetors count only about one-third the number of neutrinos that the sun "should" be sending in our direction-------- aecording to our beat theories on the nuclear reactions simmering away in the solar core. To this classical neutrino problem has been added the discovery that the solar neutrino flux varíes in ways difficult to explain. P. Sturrock and G. Walther, at Stanford University, serutinized 20 years of data from a detector deep in the Homestead Mine in South Dakota and find that the neutrino flux seems to peak every 21.3 days, varying as much as 30% to 100%. It iuay be that the sun's fusión "engine," long thought to run steadily and smoothly, sputters in a cyclic fashion? If an auto- mobile engine did this, we would take it to the garage!

(Holden, Constance; "More Neutrino Mystery," Science, 273:1663, 1996)

The problem deepens: The first 102 days of neutrino data from Japan's new Super-Kamiokande detector suggest that the solar neutrino flux is greater at night than during the day, and that it also varíes during the year.

(Anonymous; "First Data from New Neutrino Detector," Science News, 151:279, 1997)

Once we learn how to measure neutrinos really well, we can start looking for intelligent signáis impressed" upon them by advanced extraterrestrial civilizations. W. Simmons and colleagues at the University of Hawaii at Manoa point out that neutrinos are much better than electro- magnetic waves for galaxy-wide communi- cation. They are not blocked by dust ñor are they smeared out by ionized gas. Any civilization clever enough to colon- ize the entire galaxy would want to send out neutrino signáis if only to keep docks in far-flung star systems synchronized.

Simmons et al calcúlate that a neutrino detector containing a cubic kilo- meter of seawater could probably detect neutrino signáis from artificial sources located within 3,000 light years of earth. A detector that might be able to do this ís being installed in the oeean off the Hawaiian Islands. Naturally, it has an acronym: DUMAND = Deep Underwater Muon and Neutrino Detector.

(Chown, Marcus; "Do ETs Phone Home with Neutrinos?" New Scientist, p. 19, December 3, 1994)

Comment. In the year 2004, the general sdentific consensúe was that the solar-neutrino déficit could be explained if the neutrinos changed type during their flight from sun-to-earth.

UFO-TYPE OBSERVATIONS

NUMBERLESS BLACK D1SCS

Somehow, the following observation was omitted from our catalogs on anomalous atmospheric phenomena—perhaps be- cause it was hard to classify! What do you think: UFOs or windblown debris?

November 4, 1867, Chatham, England.

> On the afternoon of Monday the 4th, between the hours of three and four, I witnessed a very extraordinary sight in the heavens. I have not heard of any one hereabout having seen it. The facts are as follow:-------
> At the time above mentioned I was passing by the Mili by the Water- works Reservoir. On the gallery I noticed the miller uttering exclama- tions of surprise, and looking earn- estly towards the west. On inquiring what took his attention so much, he said, "Look, sir, I never saw such a sight in my life!" On turning in the direction towards which he was looking, the west, I also was astounded — numberless black dises in groups and scattered were passing rapidly through the air. He said his attention was directed to them by his little girl, who called to him in the Mili, saying, "Look, father, here are a lot of bal- loons coming!" They continued for more than twenty minutes, the time I stayed. In passing in front of the sun they appeared like lar ge cannon shot. Se ver al groups passed over my head, disappearing suddenly, and leaving puffs of greyish brown vapour very much like smoke.

The Editor of the journal added that several others had observed the black dises and eoncurred with Beveridge's description.

(Beveridge, James E.j "An Extraordinary Phenomenon," Symons's Monthly Meteorological Magazine, 2:130, 1867)

AN ASTRONOMER'S UFO

As long-time readers of Science Frontiers are aware, UFOs get little space here. Every once in a while, though, we see something UFOish worth passing along. The one below is from 1957, and the observer was a famous astronomer, Clyde Tombaugh, the discoverer of Pluto. Tombaugh was an avid skywatcher as well as an acute telescopic observer. He was very familiar with atmospheric phenomena. His experience belies the common assertion of UFO skeptics that "professional astronomers never see UFOs."

> An Unusual Aerial Phenomenon
> by Clyde W. Tombaugh
>
> I saw the object about eleven o'clock one night in August, 1949, from the backyard of my home in Las Cruces, New México. I happened to be looking at zenith, admiring the beautiful transparent sky of stars, when I suddenly spied a geometrical group of faint bluish-green rectangles of light similar to the "Lubbock lights". My wife and her. mother were sitting in the yard with me and they saw them also. The group moved south - southeasterly, the individual rectangles became foreshortened, their space of formation smaller, (at first about one degree across) and their intensity duller, fading from view at about 35 degrees above the horizon, Total time of visibility was about three seconds. I was too flabber- gasted to count the' number of rectangles of light, or to note some other features I wondered about later.
> There was no sound. I have done thousands of hours of night sky watching, but never saw a sight as strange as this. The rectangles of light were of low luminosity; had there been a full moon in the sky, I am sure they would not have been visible. (Signed August 7, 1957)

(Swords, Michael D.; "Clyde Tombaugh, Mars, and UFOs," Journal of Scientiflc Exploration, 13:685, 1999)

GLOSE ENCOUNTERS WITH UNKNOWN MISSILES

In addition to all those alien-controlled UFOs in terrestrial airspace, human pilots sometimes encounter bizarre mis- siles or objeets of enigmatic origin. C. Svahn and A. Liljegren have collected several intriguing cases. Here follows the so-called "Britannia Encounter":

> A few weeks later, on July 15 [1991], another Britannia Airways Boeing 737 on a holiday flight from Crete to Gatwick (London) had a similar encounter, this one at 5:45 p.m. Descending 15,0 feet, the copilot caught sight of a "small black lozenge-shaped object" some 500 meters ahead and above. The object was on a collision course, and within two seconds it passed the aircraft's wing at a dis- tance of only 100 meters at less than 10 meters above the wing. The crew felt no impact or wake, and the passengers .were not alerted. The pilot assessed the risk of collision as high.
> When reported to London Air Traffic Control Center, the missile was picked up on radar moving away from the aircraft. It was moving at 100 mph in a southeasterly direction and was no known traffíc since it had no transponder to identify it. Another aircraft was warned since the unknown target appeared to turn and head toward it, but the other aircraft saw nothing. The radar target, however, may have been a helicopter at a lower altitude.
> The sighted object was small,

some 1.5 feet In diaraeter, smooth and round. A balloon, meteorológica! or toy, was suspected, but this does not conform with the radar reporta of an object moving at 100 mph—if that was the unknown object. The official report still regarded the unknown object as "untraced."

(Svahn, Cías, and Liljegren, Andera; "Cióse Encounters with Unknown Mis- silea," International UFO Repórter, .19: 11, July/August 1994.)

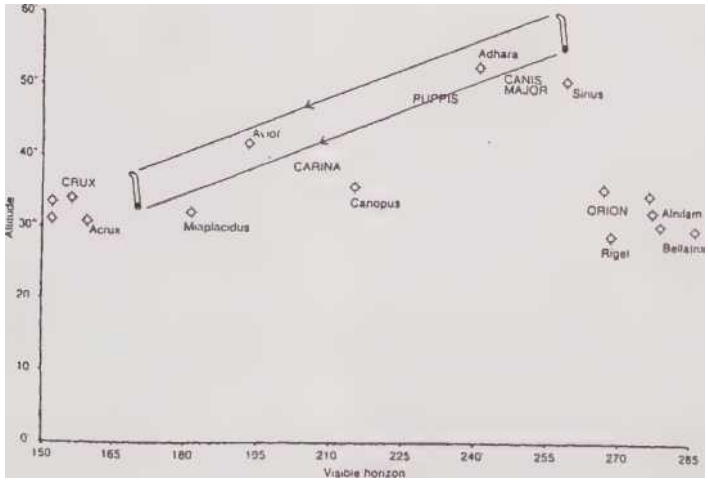
UNEDENTIFIED OBJECT

May 7, 1994, The South Pacific. On this date, the Chief Officer of the m.v. Forthbank, A.D. MacPherson, observed the object detailed below. The ves sel was at 13°09'S, 137°49'W enroute to Papeete.

Shortly after sunset at 0337 UTC the 'object' shown in the sketch was ob- served Crossing the sky from star- board. Initial observation was made as the object passed Sirius but whether or not it emanated from there remains unclear.

The passage of the object took about 20 seconds, appearing to fol- low a straight line through Canis Ma- jor, Puppis and Carina, and its lumi- nous intensity was constant until a rapid drop just prior to extinction short of Crux. The object's 'tail' extended upwards about 3" in length with a curve towards the direction of travel and had a bluish tinge while the object itself was whitish in colour.

(Ginder, D.E.; "Unidentified Object," Marine Observer, 65:73, 1995)



Unidentified object siffhted over the South Pacific from the m.v. Forthbank. It was optically tracked for 20 seconds by the Chief Officer. Date: May 7, 1994.

THE RETURN OF THE MONOLITH

Some readers have asked that UFOs receive more attention in SF. We now address these complaints with a case of adequate strangeness.

T.M. Olsen has investigated a bizarre observation from Kentucky. The date was September 28, 1996.

Vanee C. Johns, a secondary-school horticulturist, lives a rural area east of Louisville. Sometiroe between mid- night and 1:30 AM, he got up to use the bathroom and saw a strange object outside his bedroom window. His wife, Florence, keeps the drapes open on the center of three picture Windows, and he immediately opened the other drapes for a better look. The open view through the Windows, which face south, is of a grass lawn slopiríg to a curved driveway. This 0.8-hectare deared area is devoid of trees and other objeets. Two large, automatic floodlights illuminate the ground around the entire house, and under a full moon, it was bright enough to read a book. The night was clear and about 10°C with no noticeable wind. No aircraft were in the area.

At a distance of 14 m (measured after the incident) from his vantage at the bedroom window, there ap- peared on the lawn an object resem- bling a common railroad cross tie but oriented in a vertical position, with one end on the ground. It was matte black, 2 1/2 - 2 3/4 m high and 30 - 35 cm wide. The sides were smooth with a well-defined córner joining the west and north sides. The view of the top showed the west and north top edges were also well- defined. The object appeared solid but did not cast a shadow.

As Johns watched in astonishment, the object began moving toward the front porch. He could clearly see two sides of it as it approached. As the top passed under the eaves, the bottom bent backwards over the bushes which border the 71-cm high porch, in the manner of a man's leg bending at the knee, forming an ob- tuse angle. At this point, he lost sight of it, grabbed his .38 handgun, and quickly went to the Windows on the other three sides of the house, hoping to again see the object in the ampie illumination, but without suc- cess. Although the object had moved very slowly from its original position, total viewing time was less than ten seconds. There was no sound at any time during the sighting.

When Johns reported the above incident, he was advised to see the movie 2001: A Space Odyssey, in which an eerie monolith is a key player. Johns did so and commented that said monolith "blew his mind." It was just what he had seen, except that it was wider and shorter.

(Olsen, Thomas M.; "Sighting Alert," report, 1996)

Comment. We can understand why the monolith of 2001 appeared: (1) to proto- humans; (2) to lunar explorers; and (3) in orbit around Júpiter; but WHY ¿i Kentucky in 1996? There must be more to this story!

THE ARIZONA OBJECT

March 13, 1997. Southwestern Arizona.

This newsletter tends to let ufologists cope with the hundreds of UFOs that make newspaper copy each year. Once in a while, though, a major event com- mands our attention. The explanation of what happened on March 13, 1997, may turn out to be mundane, but the pheno- menon is certainly worth recording.

Our 1997 candidate for UFO-of-the- year enthralled thousands of Arizonans on Thursday evening, March 13. What- ever it was flew low from Paulden, 60 miles north of Phoenix, to at least as far as Tempe, southeast of Phoenix. The apparition cruised leisurely (perhaps only 30 miles/hour), remaining in the area for almost two hours. It consisted of a curious V-shaped formation of lights, usually flve in number. In addi- tion to the phenomenon's unusual persis- tence, there were several other notable features:

- The object, or formation of objeets, was extremély large, perhaps a kilo- meter in length.
- Although the lights were easily dis- cerned, the craft, if such there was, seemed only a vague outline that blocked out the stars.
- No sound was reported, which wpuld seem to eliminate conventional aircraft.
- Air-traffíc controllers could see the lights, but nothing appeared in their radars. One would think this fact would eliminate lighter-than-air craft.

•The lights themselves viere not sharp- íy defined like light bulbs. Rather, they appeared curiously dístorted— like a gas fíame.

Several videotapes were made of the "object,' and some were shown on TV news broadcasts.

(Price, Richard; "Arizonans Say the Truth about UFO Is Out There," USA Today, June 18, 1997. Cr. D. Phelps.)

Comment. Glven the large number of ob- servers backed by videotapes, we have a phenomenon that should receive some official attention. Nothing seems to be in the works though. Some ufologists have woridered whether the whole show was staged by the government and will be explained later as an example of how people can be deluded by ordinary man- made devices!

THE BEST UFO CASES

M.D. Swords recently asked a veteran UFO researcher which UFO cases he would rate highest in terms of believa- bility and anomalousness. The expert advanced the following five cases:

- •White Sands Missile Test Center, New México, June 10, 1949;
- •Las Cruces, New México, August 20, 1949;
- •Chesapeake Bay, Virginia, July 14, 1952;
- •Topcliffe Naval Base, North York- shire, September 19, 1952; and
- •Boianai Mission, Papua, New Guinea, June 26-28, 1959.

The critical factors in the expert's choices were: múltiple witnesses, expert witnesses, instrumented observations, anomalous behavior, and enough time to observe the phenomenon well. Each of the five cases met all or most of these criteria.

This experienced researcher, who wished to remain anonymous, probably because of government or academic con- nec-tions, concluded:

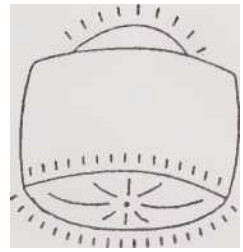
> The cases very strongly point to- wards physical objects, artificially constructed, which opérate in our skies in ways which deny any normal natural or modern technological explanaron.

Swords, a professor emeritus at Western Michigan University and also an UFO researcher, commented that he would have added several other cases to the above list, such as Levelland, Texas, Novem- ber 1957, and Coyne's helicopter sighting, October 18, 1973.

The cases cited by both individuáis occurred before 1973; none left physical evidence; none in volved abductions of the percipients. There was no claim of extraterrestrial origins.

(Swords, Michael D.; "What's Convincing about UFOs?" International UFO Repórter, 27:3, Summer 2002.)

Comment. The Sourcebook Project does maintain a few UFO files consisting of articles extracted mainly from Science journals and magazines. Our files single out only eight major cases, including World War-II's "foo fighters"; the 1997 Arizona flyover; Lakenheath, 1956; etc. (Yes, only eight compared with the tens of thousands in the UFOlogists' Computer files.) None in our puny files inelude any of those favored by Swords and the anonymous expert. Apparently, we- are fishing in different waters. The list differences also reveal a lot about the selectivity of Science journals and maga- zines, as well as our lack of effort in the pursuit of the UFO phenomenon! If we collected newspaper clippings our files would overfloweth.



Sketch of an unidentified object seen in the sky over the Indian Ocean in 1983 by the crew of the m.v. Barón Pentland. Reported in the Marine Obser- ver, a publication of the U . K . Meteoro- logical Office.

CROP CIRCLES

CROP CIRCLES NOT HOAXES: A CORRECTION

Below, when presenting T. Meaden's "middle-ground" position on the now-infamous crop circles, we state' that an earlier letter to Weather by J.W. Deardorff represented the "all-hoax" position. This was incorrect and, to be fair, we now reproduce Deardorff's letter:

> Recent letters to Weather indicate little agreement concerning the crop circles mystery, except that the phenomenon is in general no hoax. Lest it be thought that Dave and Doug made them all, including over 1000 in the season of 1990 and as many as 15 in one night, consider the following crop circle streamline configura- tions: an upper layer, with an in- ward directed swirl of stems as view- ed from above, and underneath a lower layer swirled outwards and orthogonal to the upper layer. This was the situation for the 17 m circle discovered by Busty Taylor at Head- bourne Worthy, which appeared over- night on 1 August 1986 (Delgado and Andrews 1989). Its stem "streamlines" were sketched by Meaden and Andrews (Noyes 1990). Somehow the source-meehanism of this circle ap- parently ñrst swirled every other stem outwards while leaving the re- maining stems standing, then swirled the remaining stems inwards and at right angles to the layer below, again without any appreciable breakage of crop stems.
>
> Not only does this rule out any hoax, since it defies all imagination, but it rules out any natural vortex as the cause. We have no recourse but to consider an intelligent source (Watts 1991). Readers of Weather should be aware that whenever 'plasma vortex' (Meaden 1989) is used to 'explain' the patterns in crops, 'UFO' could as well be subsituted. Paranormal events associated with the 'plasma vortex' and crop circles have been observed before by UFO witnesses since 1947, including the object's ability to undergo huge accelerations, to shroud it'self in luminosity, to van- ish abruptly even in daylight, and to cause an eerie stillness just before or after making its presence known to an observer cióse by (Meaden 1990).

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Delgado, P., and Andrews, C.; Circular Evidence, London, 1989.

Meaden, G.T.; "The Formation of Circu- lar-Symmetric Crop-Damage Patterns by Atmospheric Vórtices," Weather, 44:2, 1989.

Meaden, G.T.; "An Eyewitness Account of Crop Circle Formation," Weather, 45:273, 1990.

Noyes, R.; The Crop Circle Enigma, Baxh, 1990.

Watts, A.; "More Circular Argumente," Weather, 46:181, 1991.

(Deardorff, James W.; "Crop Circles: Someone Had to Say It!" Weather, 47: 142, 1992. Deardorff is with the Department of Atmospheric Sciences, Oregon State University.)

CKOP CIRCLES: A MIDDLE GROOND

On one hand, mainstream scientists, when they deign to notice them at all, pronounce that aU crop circles are the work of hoaxers, as in the article by J.W. DeardorfF referenced below. On the other hand, several books and a flood of reports in fringe publications claim that the crop circles, particularly the complex ones, are evidence that extra- terrestrial intelligences are attempting to communicate with us. There is also a middle ground upon which stands G.T. Meaden, a physicist, and a few other scientists. Meaden has summarized this third position in the foliowing paragraph:

> ...we believe that the formation of real crop circles is a rare phenomenon resulting from the motion of a spin- _ - ning mass of air which Professor Tokio Kikuchi has modelled by Computer simulation and calis a nano- burst. This disturbance could involve the breakdown of an up-spinning vor- tex of the eddy or whirlwind type.
> On this theoretical model such a pro- cess leads to plain circles and ringed circles—types which are known from pre- hoax times in Britain and other countries, and are the only species which credible eye-witnesses have seen forming. Aü other so-called crop circles reported in the media news in recent years are likely to be the result of intelligent hoaxing, while the so-called paranormal events to which Deardorff alludes are nothing but the consequence of poor observa- tion and/or exaggeration by susceptible mystics and vulnerable pseudo- scientists. In the absence of hoaxing the subject would still be unknown to the general public because the aver- age number of real-circle reports per annum is small (indeed in some years it may be zero) .

(Meaden, G. Terence; "Crop Circles: The Real and the Hoaxed," Weather, 47:368, 1992. Deardorff, J.W.; "Crop Circles: Someone Had to Say It!" Weather, 47:142, 1992)

CROP-CIRCLE LITMÜS TEST?

Crop-circle articles that appear in scien- tific journals, when they appear at all, are usually of the debunking variety.
But here follows the abstract from a recent paper printed in a European jour- nal. It presents data that could lead to a technique for separating "real" crop circles from hoaxes!

> Crop formations consist of geometri- cally organized regions ranging from 2 to 80 m diameter, in which the plants (primarily grain crops) are flattened in a horizontal position. Plants from crop formations display anatomical alterations which cannot be accounted for by assuming the formations are hoaxes. Near the soil surface the curved stems often form complex swirls with "vortex" type patterns. In the present paper, evidence is presented which indicates that structural and cellular alterations take place in plants exposed within the confines of the 'circle' type formations, differenees which were determined to be statistically signifieant when compared with control plants taken outside the formation. These transformations were manifes- ted at the macroseopic level as abnormal nodal swelling, gross malforma- tions during embryogenesis, and char- red epidermal tissue. Signifieant changes in seed germination and de- velopment were found, and at the mieroscopic level differenees were observed in cell wall pit structures. Affected plants also have characteris- tics suggesting the involvement of transient high temperatures.

(Levengood, W. C.; "Anatomical Anoma- lies in Crop Formation Plants," Physio- logia Plantarum, 92:356, 1994. Cr. N. Talbott.)

A DIFFERENT SORT OF CROP CIRCLE

Ball lightning reports are very common, but here is one worth recording because of its unusual physical effeets. It was investigated and reported by O. Stummer.

> In May or June of 1988 or 1989 around 2 P.M. CEST, Mr. Alois Fueh- rer, a farmer of 38 years from Jung- schlag, a small village south of Otten- schlag, northern Lower Austria, 850 meters above sea level, returned early from fieldwork because a heavy thunderstorm moved in from the north- west. Fuehrer stood in the open on a wooden plank at the rear of the diesel tractor driven by his father. The vehicle had passed the last Otten- schlag houses southbound, when he noticed a falling object. It was round, 20 centimeters across, and "seemed to come down like a toy balloon", vertical, soundless, without rotation. It was brilliant white, a steady light, and had "something like a smoke trail". Only 20 to 30 meters to the right of the tractor and of the road, after 4 to 6 seconds, the object hit the surface of a green summer barley field, flashed up and "exploded with a loud, very high pitched bang". Mr. Fuehrer said "this was no thunder", and noticed no heat or pressure wave. However, what he felt caused panic— a tingling,- and his hairs stood on end on his head, neck, even on his hands. He urged his father: "Get out of here, the next one will kill us!", wlio also felt the electrostatic effect in the driver's cab. The diesel tractor con- tinued to function normally.
> Arriving home, the Fuehrers still wondered what had happened and they went back to have a look on the same evening. They found a circular patch about 6 meters across in the impact area where green barley plants had been reduced to ashes and smoke, "as with a cutting torch". The burn effect was strongest in the center.
> The soil had not been moved.

(Keul, Alexander G.¡ "Two Exceptional Ball Lightning Cases," Journal of Mete- orology, U.K., 24:178, 1999)

CROP CIRCLES CAN BE NATURAL

Before today's prolifíc crops of bogus crop circles, there were rare instances where nature neatly carved circles in fields of grain. These legitímate crop circles have been trashed with the fake ones and are still unexplained. A good example of the "real thing" was resur- reeted in the Journal of Meteorology. The original source is: Nature, 22:290, 1880. J.R. Capron, a respected spectroscopist of the tíme, was the repórter.

> The storms about this part of Surrey have been lately local and violent, and the effeets produced in some instances curious. Visiting a neigh- bour's farm on Wednesday evening (21st), we found a field of standing wheat considerably knocked about, not as an entirety, but in patches forming, as viewed from a distance, circular spots.
> Examined more closely, these all presented mueh the same character, viz., a few standing stalks as a centre, some prostrate stalks with their heads arranged pretty evenly in a direction forming a circle abou the centre, and outside these a circular wall of stalks which had not suffered.

Capron thought the nearly perfect circles of crop damage bespoke cyclonic wind damage.

(Van Doorn, Peter; "A Case of Genuine Crop Circles Dating from July 1880 As Published in Nature in the year 1880," Journal of Meteorology, U.K., 25:20, 2000)

ALIEN CROP-CIRCLE MAKERS DUTIFULLY OBEY EARTH'S LAWS

During the time of the UK's hoof-and- mouth- disease crisis in 2002, R. Sargent posted the following on his web site regarding crop circles:

> In general the aüens, great ones, magnetic vórtices, and human artists seem to have heeded the British government's strict rules regarding countryside access during the recent foot-and-mouth disease epidemia among livestock. The, when the restrictions were lifted circles bloomed...

(Sargent, Ross; "Crop Circles," Skeptí- cal Inquirer, 27:68, January/February 2003. The BBC also noted this cessa- tion of alien visits at http://news.bbc.co.uk/2/hi/sci/tech/1496296 .stm.)

Carbón	6
+Neon	10
+Sodium	11
+Rhodium	45
+Tellurium	52
+Hafnium	72
+Actinium	89
Total	285
Boron	5
+Fluorine	9
+Scandium	21
+Iron	26
+Cadmium	48
+Lutetium	71
+Hahnium	105
Total	285

DIM	OWE	TUG	RAP
RIG	TAP	DOT	RAY
THE	TIP	NAP	DID
PAP	DUD	SPY	TO

(Cipra, Barryj "Algorithmics = Has Trim Logic," Science, 299:650, 2003.)

Comment. Now we are ready to search for hidden messages in DNA and RNA; maybe histones, too!

MESSAGES

Satinover is a psychiatrist and lec- turer on the relationship between science and religión. He commented:

> I guess the bottom line is, if the re- search holds up and no flaw is found in the methodology, then I think the implication is clear that the author- ship of Génesis is not human.

Unsettling though the implieations are to mainstream science, the research has made it past the usual critical hurd- les into two scientific journals: Statisti- eal Science and Journal of the Royal Sta- tistical Society.

Scientists familiar with the Work can only say that, "Something weird seems to be happening." We certainly agree!

(Briggs, David; "Researchers: Word Pat- terns in Génesis Suggest Divine Writing," Chillicothe Gazette, Oetober 28, 1995.
Cr. J. Fry vía COUD-I. COUD-I - Col- lectors of Unusual Data-International.
The Gazette Ítem was based on an Associ- ated Press release.)

TRANSCENDENTAL MESSAGES IN TRANSCENDENTAL NUMBERS

Those complex crop circles supposedly conveying messages from extraterrestrial entities all seem to be hoaxes. We must, therefore, search out other sources of transcendental signáis. Fortunately, a birand-new, unhoaxable communication channel has opened up.

Forget standard numerology, the Number of the Beast (666), and all that. Instead, give the letter A the valué 1, B = 2, C = 3, etc. Next, add to your scheme a breakthrough discovery of L. Sallows, let 0 = _, and interpret _ to be a space, so that we can make sentences out of words. Finally, diseard our usual base of 10 and adopt as a base 27— the number of letters in our alphabet plus _, the space. In this system, B_C decodes as $2 \times 27^{\wedge} + 0 \times 27^{1} + 3 \times 27^{\circ}$, which equals 1461 in decimal. Now we have a way to convert numbers into words in a novel, though tedious, way, and vice versa.

For example, CHAT + TALK = WIND, which is not an unlikely word equation. Really fantastic word-number equalities can be found with the help of a Compu- ter. Who would have ever guessed that the following magic square of meaningful words could be constructed?

The magic constant is BEAN, and all horizontal, vertical, and diagonal rows add up to this constant.

The real valué of this system of numerology is apparent when we turn to eternal verities: the transcendental numbers such as pi, e, and the Golden Mean (1,618034....). The latter con- verts to: A.PRNTPFCÜCRKDYGRYLLC- QNBIG... Ah, BIG, part of a message, no doubt! Sallows remarks, "Perhaps the first message to appear in pi is ...GOD_EXISTS..., While that in e roíght be .. .PROVE_IT..Repair to your computers to find the meaning of it all.

(Stewart, Ianj "Number Mysticism for the Modern Age," New Scientist, p. 16, July 10, 1993)

(Anonymous; "Organice Reduce Ground-water Pollution," Acres U. S. A., p. 11, May 1999. Cr. L. Cortner.)

And to whom does the journal Marine Observer turn when expert opinión is required on marine phenomena, in- cluding fish identification? Dr. Peter Herring!

NOMINATIVE DETERMINISM

NOMINATIVE DETERMINISM

We can no longer resist passing along this very important anomaly, which in essence is the human compulsión to take up a profession described by his or her surname. No less an authority than C. Jung wondered about this common phe- nomenon in his elassic Synchronicity;
An Acausal Connecting Principie. He noted, for example, that Herr Feist (Mr. Stout) was the food minister and Herr Rosstauscher (Mr. Horsetrader) was a lawyer. He mused:

> Are these whimsicalities of chance, or the suggestive effects of the ñame, as Stekel seems to suggest, or are they 'meaningful coincidences'?
>
> Jung never answered his own question.

The British New Scientist, in its "Feedback" eolumn, has since tackled this enigmatic phenomenon many times. Nominative determinism was introduced first in 1994, when it was remarked that a paper on incontinence in the British Journal of Urology was authored by J.W. Splatt and D. Weedon!

New Scientist readers added many more examples, proving just how power- ful this psyehological forcé really is.

> The head of planning for British Airways is Rod Muddle.. .Francés Crook is the director of the Howard League for Penal Reform.. .S.M. Breedlove writes on sexual dimorphism for the Journal of Neuroscience... The US Heritage Foundation's sénior research- er on children in foster care is Pat- rick Fagan...etc. ad infinitum.

(From New Scientist "Feedback" columns of April 20 and June 22, 1996)

MONOGRAMMIC DETERMINISM

About 2 years ago .(above), we suc- cumbed to the lure of "nominative determinism." The Feedback page of the New Scientist had been printing case after amusing case in which a person's occupation was described or suggested by his or her surname. A classic example is seen in a paper on incontinence published in the British Journal of Urology by J.W. Splatt and D. Weedon! Does a person's ñame exert a psycho- logical forcé of the cholee of a career?

We' have seen no formal studies of nomi- native determinism, but we have just discovered a closely allied phenomenon that has been scientifically investigated. We cali it "monogrammie determinism.'

An individual's monogram does not seem to be associated with his or her occupation but rather with longevity. People with monograms such as ACE, WOW, or GOD tend to live longer than those with monograms like PIG, RAT, DUD, or ILL.

The study was conducted at the Uni- versity of San Diego, where 27 years of California death certificates were ex- amined. Only men were chosen because their initials did not change with marri- age. They were divided into three groups:

(1) Those with "good" monograms;

(2) Those with "bad" monograms; and

(3) A control group with "neutral" monograms.

Those men bearing "good" monograms lived 4.48 years longer than those in the control group; those with "bad" monograms, 2.8 years less.

Manifestly, being called DUD or PIG all your life can shorten it. Being ad- dressed as ACE or GOD can give one a psyehological boost that prolongs life.

(Anonymous; "Do Initials Help Some Live Longer?" San Mateo Times, March 28, 1998. Cr. J. Covey.)

MORE NOMINATIVE DETERMINISM

Following in the trail of Feedback's page in the New Scientist, we herewith offer two more cases of nominative determinism or ND. This phenomenon, as readers of SF are well aware, occurs when a person's last ñame is related to his or her occupation.

A solid example of ND is seen in the ñame of the Director of U. S. Programs for the Rodale Institute. The Institute, it turns out, is studying carbón and nitrogen balances in organically managed cropping systems. Nitrates originating in such agriculture contamínate the ground water and often end up iri drinking water. The EPA has determined that nitrates in drinking water can be harm- ful; thus this study. Who direets the study? Dr. Laurie Drinkwater!

HUMOR

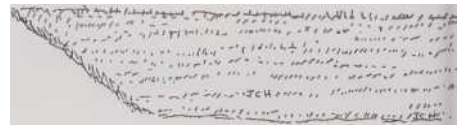
LEVITATION AND LEVITY!

New Scientist's "Feedback" page, our favorite source for remarkable insights into cosmic phenomena, noted recently that the magazine Omni had announced the winner of its "Theories" contest. The winning entry was revolutionary, to say the least. In the words of the inventor:

> When a cat is dropped, it always lands on its feet, and when toast is dropped, it always lands with the buttered side facing down. I propose to strap buttered toast to the back of a cat; the two will hover, spinning inches above the ground.

There is a deep profundity in this arrangement. S. Voss recognized immedi- ately that a perpetual motion machine had been proposed. He set out to find a flaw. Somehow, energy was being sup- plied to keep the cat-toast armature turning. Voss observed that any practí- eal cat-toast motor would have to be ■suspended over a very expensive carpet, for the simple reason that the probability of the toast landing buttered-side down is well known to be proportional to the cost of the carpet. (Linoleum is very poor in this application.) Furthermore. to maintain the machine's efficiency, the rug would have to be frequently cleaned of falling cat hairs. Carpet cleaning is energy-intensive, and it is here that energy must be supplied, thereby nulli- fying the perpetual-motion claim!

(Anonymous; New Scientist "Feedback" columns for October 19 and November 16, 1996)

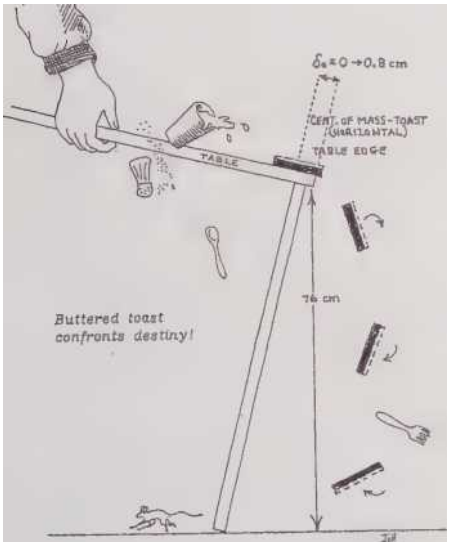


THE DYNAMICS OF OLEAGINATED CARBOHYDRATE PARALLELOPIPEDS

Science can be very helpful in elarifying the many puzzles encountered in every- day Ufe. This wilUngness to study mun- dane phenomena is seen in a recent analysis of tumbUng, buttered toast. We quote from the abstract of the highly teehnical American Journal of Physics.

> In the study reported here it is found that the experimentally determined free fall angular velocity of a board, tumbUng off the edge of a table, can only be predicted at aH accurately if sUpping is taken into account. The size and shape of the board used in the calculations and in the experimente were roughly the same as that of a piece of toast. In addition, it is found that the board, tumbUng from a standard table of height 76 cm, wül land butter-side down (neglecting. any bounce) for two ranges of overhang ($_0$). $_0$ is defined as the initial dis- tance from the table edge to a vertical Une drawn through the center of mass when the board is horizontal. For our board (length 10.2 cm) the approximate ranges of overhang are 0-0.8 and 2.7-5.1 cm. The importance of the 0-0.8 cm (only 2% of all possi- ble overhangs for which tumbUng is possible) favoring a butter-side down landing should not be overestimated when pondering the widely held beUef that toast, tumbUng from a table, usuaUy faUs butter-side down.

(Bacon, M.E., et al; "A Closer Look at TumbUng Toast,'[1] American Journal of Physics, 69:38, 2001)



THE PERILS OF DHMO

Warnings are appearing in many places about■ the dangers of the "killer" Chemical dihydrogen monoxide (DHMO). The situation is serious enough to warn the readers of Science Frontiers. We quote from New Scientist, which got it from a notice on the Internet.

> "Dihydrogen monoxide is colourless, odourless, tasteless, and kiUs un- counted thousands of people each year," the notice warns. "Most of these deaths are caused by accidental inhalation of DHMO, but the dangers of dihydrogen monoxide do not end there. Prolonged exposure to its soUd form causes severe tissue damage. Symptoms of DHMO ingestión can inelude excessive sweating and urination, and possibly a bloated feeUng, nausea, vomiting and body electrolyte imbalance..."

Contamination by DHMO is worldwide. It has been found in every stream and lake, even in the Antarctic. It is a major. component of acid rain and contributes to the greenhouse effect. Yet, world governments refuse to take steps to ban its use in solvents, coolants, fire retardante, etc.

(Anonymous; "Feedback," New Scientist, p. 96, May 18, 1996)

LET THERE BE DARE!

And there was dark. And nobody Üked it. Bye and bye, a large gentleman with a grossly damaged Uver happened by and helped the dark-immersed denizens of the planet. He showed humans how to make "dark-suckers." The fírst dark- suckers were made of wood and simple in design. Dnfortunately, these primitive models often got out of control and sucked in too much dark. Another early dark sucker was the candle. The black wicks of these models attest to their dark-sucking capabiUties. Modern dark suckers, such as the ineandescent bulb, are much more efficient. These bulbs become greyer with age reveaUng how they function to rid the world of dark.

(Walke, Ken; "Grey Matter," New Scientist, p. 117, February 24, 2001)

Comment. In his revisionist thinking, Walke exposed our misconceptions about Ught in reponse to the following ques- tion: "The surfaces of the ineandescent Ught bulbs where I work become pro- gressively greyer over time.Why?" Now we know why this is so

THE WIMPATCH

We honestly should not inelude this Ítem with our usual digests of scientific articles, but there is a certain relevance and connection.

The modern workplace has become increasingly uncomfortable for macho males. Today's offices place a premium on submissive teamwork, bland relia- biUty, submissive poüteness to aU, and, especially, the strict avoidance of specu- lative glances at female coworkers. In other words, wimpishness is valued highly in the modern office environment.

For those males not naturaUy wimpish, biochemists at DREADCO [a fíctitious research group] is developing a skin patch that leaks a testosterone antagon- ist into the bloodstream. This device wül be called a "Wimpatch" when it reaches the marketplace. The macho male appUes the patch in the morning and shrinks into a submissive, sexless team player at work. After 5:00, he removes the patch and restores his normal testosterone levels.

(Jones, David; "Danger! Men at Work," Nature, 404:950, 2000)

Comment. The Wimpatch idea is scientifi- cally sound and wül be an excellent sub- stitute for the soma consumed in Brave New World. Next, the DREADCO chemists should develop a skin patch that insures that society wiU never again be afflicted by Pauls, Swedenborgs, Mozarts, and similar misfits. This could be called a "Conformipatch." How about a patch for "poUtical correctness," a "Polcorpatch"?

BRITAIN MORE HAZARDOUS THAN EVER

Accident figures derived from selected British hospital admis sion records show that visitors to this island nation must be very careful indeed. The following data are extrapolated to the country-as-a-whole.

Type of Accident	Increases ' 1998/1999
Tea cosies	20/37
Place-mats	157/165
Trousers	5137/5945
Socks and tights	9843/10733
Vegetables [bananas?]	12362/1313
Tree trunks	2
Bird baths	1777/1810
Bean bags	117/361

(Anonymous; "Feedback," New Scientist, p. 104, June 7, 2001)

(Left) A candle tmmersed in the dark with unactivated wick. (Uiddle) Activated candle wick sucks in the surroundíng dark. (Right) The dark in the vicinity of the candle has been fully absorbed by the darkened candle wick.

OBSERVATIONS

SOMETHING ROTTEN AT THE CORE OF SCIENCE

H.F. Horrobin is a long-time critic o£ the anonymous peer-review system üsed in the scientific community. Most anoma- lists will readily subscribe to his com- plaint:

> **The core system by which the scientific community allots prestige (in terms of oral presentations at major meetings and publication in major journals) and funding is a non- validated charade whose processes generate results little better than does chance. Given the fact that most reviewers are likely to be mainstream and broadly supportive of the existing organization of the scientific enter- prise, it would not be surprising if the likelihood of support for truly innovative research was considerably less than that provided by chance.**

(Horrobin, David F.; "Something Rotten at the Core of Science," Meta Research Bulietin, 10:17, June 15, 2001)

THE BERMDDA TRIANGLE IS STILL SPOOKY

The London Times is a very reputable paper, so we must assume the following story is accurate. It may have a sensible explanation, but it is generic Ber- muda Triangle material.

> **A Roy al Navy frigate found a yacht abandoned and adrift in the Bermuda Triangle. Crew from the HMS London, who boarded the 50ft Germán ketch Ruth in the mid-Atlantic last week were baffled to find clothes and personal belongings lying around, and even an open book on a bunk.**

The HMS London crew cleaned up the vessel and made minor repairs, but it was otherwise shipshape. They learned that the boat belonged to a Germán couple hoping to sail around the World. Evidence indicated that the yacht had been adrift for all of 10 months.

Repairs made, the Royal Navy crew headed for Puerto Rico, but the Bermuda Triangle did not release its grip. The new crew encountered huge storms, their navigation equipment failed, as did the engine. üsing sails, the crew persevered. Now the final twist of the tale.

> **Once out of the Bermuda Triangle, the equipment started working again, and the crew arrived safely in Puerto Rico to rejoin HMS London on July 12.**

(Foreign staff; "Abandoned Yacht Found Adrift in Bermuda Triangle," London Times, July 16, 1997. Cr. A.C.A. Silk.)

Comment. Could the missing Germán couple now be living in Argentina under new ñames? If we find out more or learn that the story is a hoax, we'll let you know.

LUCE OR FATE?

> **Bristol University scientists say they will follow the lives of 14,000 children to "discover whether we are ruled by fate or create our own luck."**
>
> **Should have results in two years, with a few breaks.**

(Anonymous; "Free Will Offering," Chicago Sun-Times, June 20, 2001. Cr. J. Cieciel.)

Questions. How can these scientists distinguish between fate and luck? How did this grant ever get past peer re- view?

NOBEL GOSSIP!

Have you heard that:

•Alfred Nobel originally planned to use his fortune for the construction of crematoria all over Europe, but opposition from the Catholic Church forced him to find another way to use his mo.ney; thus, the coveted prizes?

•And that Nobel never established a prize for mathematics because his wife had had an affair with a matheraatician?

(Griffith, John; "Smoke Scheme," New Scientist, p. 48, January 14, 1995)

Comment. This gossip has been challenged by historians.

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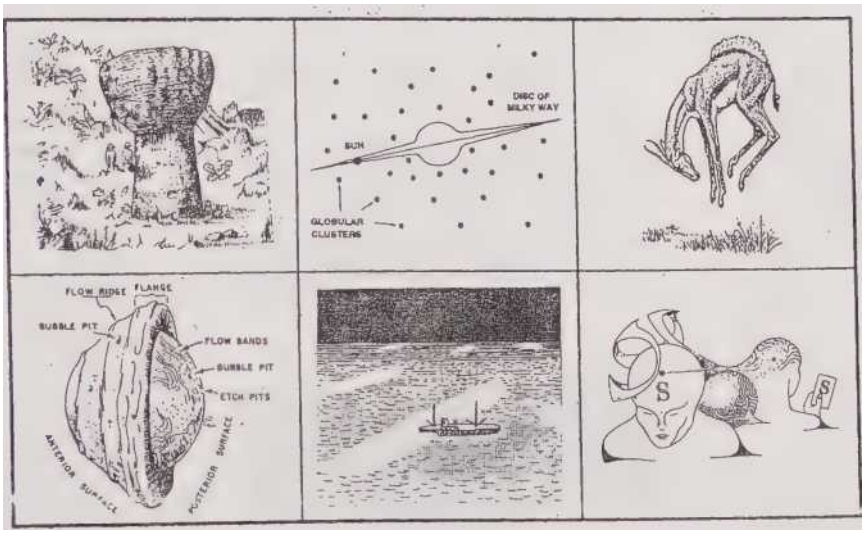

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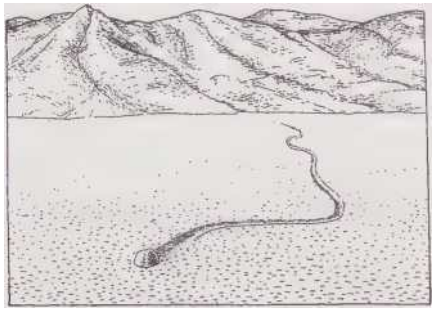

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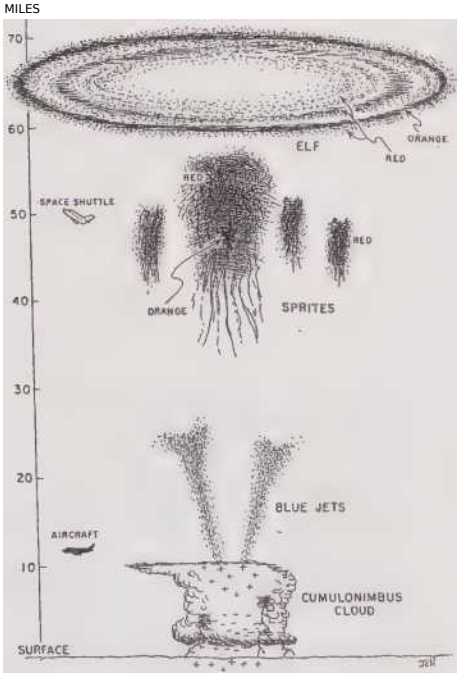

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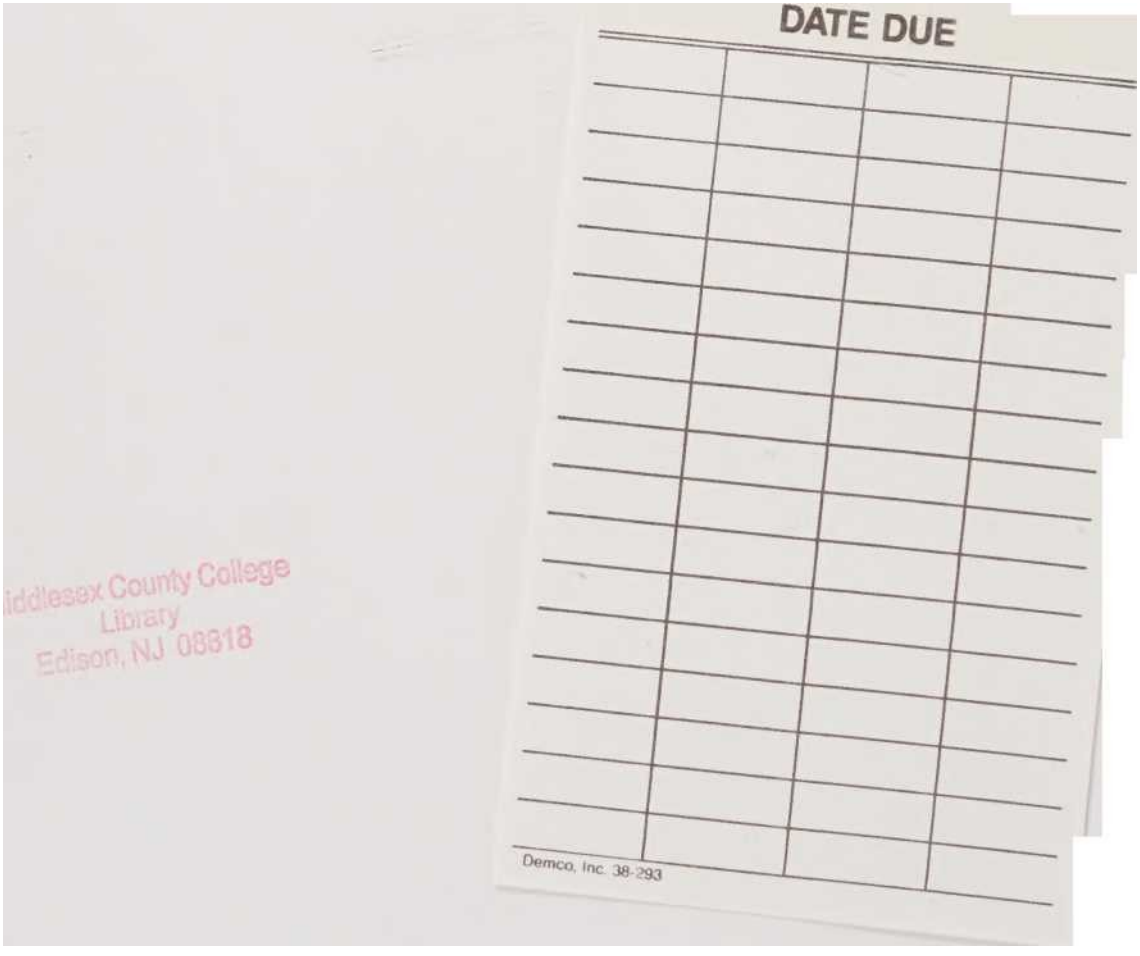

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